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OSTM/Jason-2

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OSTM/JASON-2 PROJECT PLAN

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1. INTRODUCTION

1.1 BACKGROUND AND SCOPE

In December 1996, the Centre National d'Etudes Spatiales (CNES) in France and the National Aeronautics and Space Administration (NASA) in the United States formally agreed in a Memorandum of Understanding (MOU) to jointly participate in the Jason-1 mission to design, build, deploy, and operate a satellite to continue the collection of sea-surface elevation measurements originally begun by the TOPEX/Poseidon (T/P) mission. The TOPEX/Poseidon mission, which was launched in August 1992, was the first such mission in a world-wide effort to study and describe global ocean dynamics and its relationship to the Earth's environment and climate change. The unprecedented success of TOPEX/Poseidon led mission planner to recognize the need to sustain the high accuracy measurements of sea surface elevation in order to integrate this information into climatic models for long term climate prediction.

Jason-1 was successfully launched in December 2001, and since then is delivering geophysical data at a level of performance identical to TOPEX/Poseidon (T/P). Jason-1 is noticeably different from T/P in that the measurements are no longer experimental in nature, near-real time products derived from the altimetric measurements are being disseminated on a routine basis.

To continue the observations made by T/P and Jason-1 and provide a transition into operational altimetry missions in the future, NASA, CNES with NOAA and EUMETSAT have decided to launch a JASON-1follow-on mission, the Ocean Surface Topography Mission (OSTM)/Jason-2 mission. The Jason-2 satellite will carry similar instruments to Jason-1 as its baseline payload, and fly in the same orbit as Jason-1. The primary mission objective is to continue the T/P/Jason-1 measurements with the same performance. The availability of a continued data stream from altimetric measurements with near real-time access has resulted in the participation in this mission of NOAA and EUMETSAT agencies interested in the operational applications of these data. The Jason-2 satellite is planned to be launched in 2008.

In accordance with the MOU between CNES, EUMETSAT, NASA and NOAA, hereafter referenced as “the partners”, the Project Plan defines the means by which NASA and NOAA in the U.S., and EUMETSAT and CNES in Europe shall jointly act in cooperation to execute the OSTM/Jason-2 mission.

The Project Plan is a mutual CNES / EUMETSAT / NASA / NOAA plan for developing the systems which support the space, launch, ground, and science segments for the OSTM/Jason-2 Mission. This plan defines how this cooperative project will be implemented, including:

- mission management (responsibilities, reviews, configuration control, documentation, actions management, confidentiality, schedule management),
- reciprocal products deliveries and management of their interfaces (launcher, satellite, payload, instruments, ground systems),
- mission operations (responsibilities, data deliveries),
- and other such information as the Project Managers deem necessary for project control.

The Project Plan document applies on the same time period as the MOU i.e on the entire mission life as defined in the MOU. If needed, modifications will be introduced in the document to better cover the transition from development to operation and the routine operation phases.

Section 1 of this document provides general information and recalls the Science and Programmatic background of the project.

Section 2 of this document lists the highest level requirements and constraints placed upon the project.

Section 3 describes the mission overall organization, the management responsibilities at program, science and project level. It also recalls the division of responsibilities between the four partners.

Section 4 describes the Mission Assurance processes, including Safety aspects, and Risk Management approach.

Section 5 describes briefly the flight system elements as they will be delivered by each participating agency and according to the division of responsibilities given in section 3. Responsibilities of each agency during the development, assembly integration and test , and launch campaign phases are addressed. This section describes the ground system architecture and the concept which will be applied for satellite operation, the way it will be conducted according to the different phases and the responsibility of each agency. Then the data processing scheme, the definition of the data products, the way they will be processed and what shall be exchanged between the agencies to this purpose is presented. Finally, the verification activities are described in this section.

Section 6 describes the system level documentation along with the agency responsible for the document's preparation and the agencies with authority to approve each of the listed documents.

Section 7 briefly describes the configuration management principles and rules that will be formally applied in case of modifications of document affecting the mission requirements and /or interfaces between the system elements.

Section 8 addresses the major reviews conducted at program and project level and which shall periodically assess the progress of the project.

Section 9 describes the way the master project (Level 1) schedule and lower level schedules are built and controlled.

Section 10 describes the Project reporting rules and management processes, including action item management, and project teams interaction.

Finally section 11 addresses the management of hardware and software deliveries between two or more of the project partners

1.2 MISSION SCIENCE OBJECTIVES

The main objectives of Jason-2/OSTM include the continuation of the T/P and Jason-1 missions, based on the science and pre-operational returns of these two missions, and the support in a timely manner to the global and regional operational applications.

1.2.1 RESEARCH TOPICS COVER MANY DIFFERENT FIELDS :

Description of the mean ocean circulation using altimetric sea level measurements is essential to better understand its interaction with the time-varying components and the involved mechanisms. It is also important for initializing ocean models. The large accumulation of altimetric data from the early missions through Jason-2/OSTM and follow-on, along with high resolution marine geoid derived from space-borne gravimetric measurements (CHAMP in 2000, GRACE in 2002, GOCE in 2005) will provide significant contributions to a better understanding of this "mean" ocean.

The ocean exhibits variability at different scales in time and space, affecting significantly mass and heat transport, exchanges with the atmosphere, and consequently the climate. Sea surface topography as measured by altimetry has proven its usefulness to understand the physics behind this variability. Model parameterization has been improved thanks to these new findings. But there is still more to do. Apart from the seasonal cycle, which leads to an increase or decrease in sea level in each hemisphere, exceeding 15 cm in some areas, there are significant variations from one year to the next which are not yet well understood. The El Nino event, the North Atlantic Oscillation, the Pacific Decadal Oscillation, the planetary waves crossing the oceans over periods of months to years and even decades are among the mechanisms which need to be better characterized.

Because of the long period of these phenomena, very long time series of altimetric observations are needed, requiring Jason-2/OSTM and follow-on missions.

Mesoscale ocean variability is associated with shorter time and space scales (typically 1 month/30-100 km) but it impacts significantly the energy balance within the ocean and between the ocean and the atmosphere. Western boundary turbulent currents and the energetic whirlpools which they form, play an essential role in moving heat from low to high latitudes. But eddies are traveling over all the oceans interacting with the lower frequency modes as well as with the coastal currents, coast line, continental shelf, and bathymetry. This eddy activity is now quite well characterized statistically, thanks to the multi-year accumulation of altimetric data. But we need to go one step further to decode this complicated turbulent physics and to transcribe it better in the eddy resolving open ocean and coastal models. Jason-2/OSTM (as Jason-1 and T/P) will provide spatial resolution not optimized for such investigations (320 km at the equator), but its contribution along with complementary missions (e.g. ENVISAT and follow-on) will be essential.

At the other end of the ocean variability spectrum, the secular mean sea level trend is a pertinent indicator of global warming. The unique accuracy of T/P sea level measurements has demonstrated an unexpected capability of recovering a global trend of about 2 mm/year. Nevertheless, this parameter has an extremely small variation, at the limit of what can be observed even with systems as efficient and accurate as T/P and Jason-1. Only long term time series over several decades will decrease the error bar at a level consistent with the small amplitude of the signal. The continuation of Jason type missions is a unique way to fulfill this objective of great importance and of general interest.

In the domain of tide modeling significant progress has been made thanks to the altimetry, in particular T/P data. Several models now are able to predict the main diurnal and semi-diurnal components of ocean tides with an exceptional precision of 2 cm rms. But investigations are continuing to track more subtle tide signals, including long period components, coastal interactions, internal waves generated by the tides, and tidal energy dissipation. All these issues need the continuation of altimetric missions, including Jason-2/OSTM, to provide the appropriate space and time sampling of the sea level.

Other domains will benefit from the Jason-2/OSTM mission. Estimates of wave height and wind speed derived from the radar altimeter echoes are two parameters which are of great value for marine meteorology and climatology studies as well as operational sea-state forecasts investigations in the field of earth sciences, such as research on marine geoid, tectonics, hydrology, ice, closed seas, great lakes, and desert regions, will also greatly profit from the continuation and the merging of high precision Jason-2/OSTM altimetric measurements with other data sets.

1.2.2 OPERATIONAL APPLICATIONS, PREDICTING THE OCEAN WEATHER:

One of the major objective of the Jason-2/OSTM mission will be to support the transition from the ocean operational system demonstration phase (the 2003-2006 GODAE time frame) to the ocean routine operations. Operational activities can be divided into two categories depending on the time-scale : the short range ocean forecast (in which we can include coastal aspects) and the seasonal to long term range ocean forecast.

1.2.2.1 SEASONAL OCEAN FORECASTING

The seasonal ocean forecasting is one of the most demanding and ambitious objectives. Information on these time scales provided by altimetry to the ocean models is essential, because the role of currents is not yet well understood and well parameterized. Even if progress in the related physics is expected within the next years, the near-real time ocean state estimates derived from altimetric data and assimilated continuously with other data sets, into models is of great value. This assimilation leads to a description and a prediction of oceanic currents, temperatures, and salinity with a level of precision that has never before been obtained. The question of longer term predictions (interannual to decadal) is of importance, but research in this field is just starting, so long term routine ocean forecasts will not emerge in the near future. As mentioned previously, long time series of accurate altimetric data (Jason-2/OSTM and follow-on) will help in understanding this ocean long-period variability and its interaction with short term modes (participating thus in the improvement of seasonal forecasts).

One example of seasonal ocean forecast operated on a routine basis is the one provided by NOAA. Since 1996, T/P sea level anomalies have been assimilated each week in the National Centers for Environmental Prediction (NCEP) Pacific Ocean model used to predict El Nino and Southern Oscillation (ENSO). This processing is done in near-real time thanks to the 2-day latency delivery of T/P interim geophysical data. In the mean time several groups around the world are working on the coupling of ocean with atmosphere to develop seasonal climate forecasting models. Such models will use as inputs the ocean analysis and predictions released by ocean operational centers.

1.2.2.2 SHORT RANGE OCEAN PREDICTION

The short range ocean prediction has many applications of great interest. Several global and regional models have been developed and run in an experimental or pre-operational configuration, before entering the operational phase (e.g. MERCATOR, FOAM, ECCO...). They provide high resolution, high frequency 3D products which depict and forecast a few weeks in advance the very short scale nature of the ocean signal, including current positions and intensity, position and scales of eddies and thermal fronts. One issue which is especially challenging is understanding the connection of the open ocean with the coastal ocean and development of models capable of recovering the sharpest details. Because of the highly turbulent characteristics of this short range signal and its non-linear evolution, it is necessary to take advantage of global, dense, and accurate observations. Altimetry is especially powerful for monitoring in near-real time the mesoscale signal and adjusting regularly the models. The derived products satisfy many applications (e.g. marine safety, marine pollution, ship routing, navy needs, oil drilling, coastal forecasts, fish stock management...).

For instance, based on these products, links can be observed between the marine environment, the rate of marine species reproduction, and their life cycle. Consequently, this is helpful to better manage variations in fishing resources according to fishing campaigns. Fishing industry management is a promising market for short range mesoscale products (e.g. CLS CATSAT project, NOAA fishery service forecasts). The offshore drilling oil industry is also interested in those products because petroleum companies are going further from the coast and into deep water. Oil is brought to the surface through flexible umbilicals to barges anchored above the site, and tankers then remove the oil from these barges. Knowing the currents at the surface but also at a depth of several hundred meters is very useful for this type of operation sensitive to destructive eddies and fronts. Navy forces need also for their own needs specific forecasting and analysis of short range oceanic state. Water masses, temperatures, currents, eddies, and the position of fronts are essential information to help both surface and underwater navigation.

Another field of activity is that concerning coastal areas where there are many problems related to risk prevention and coastal development. High resolution models require as an input high accuracy products in the coastal band as well as at the deep ocean boundary. One example is the prediction of storm surges. They generate an abnormal increase in sea level (up to few meters) caused by low pressure together with high winds blowing from the sea toward land (amplified during hurricane situations) which can be particularly devastating to the shoreline. Another example is the trajectory monitoring and forecasting of drifting polluted waters, ships, and objects lost at sea. The drift is a result of the combined actions of currents pushed by the wind, tide, and coastal currents and large-scale oceanic circulation. Its forecast is based on dedicated oceanic models coupled with models describing the behavior and changes of the drifting materials. In this domain too, altimetry products have a key role to assess and to constrain frequently the models, improving thus the forecasts.

Meteorological centers run sea state forecast models to anticipate the evolution of waves and swells, which are superimposed, on all parts of the Earth, providing sailors and workers at sea with regular forecasts and special weather updates when weather conditions deteriorate. Such models (e.g. VAG at Météo-France, WAM at the ECMWF European Center) benefit greatly from real-time wave-height and wind speed altimetry products such as those issued within 3 hours from ERS2, Jason-1, and ENVISAT.

1.3 DEVELOPMENT, TEST AND MISSION PHASES

1.3.1 DEVELOPMENT AND TEST PHASES

1.3.1.1 SATELLITE AND INSTRUMENTS DEVELOPMENT AND TEST PHASES

The Jason-2 satellite is the fourth satellite using the PROTEUS platform, minisatellite family developed in the frame of a CNES / ALCATEL partnership programme, qualified through the Jason-1 mission and upgraded since CALIPSO.

The payload and satellite schedule do not follow the standard development scheme of a non recurrent satellite: this is due to the use of a generic platform, already qualified in flight, and the instruments integration in a Payload Integration Module (PIM) recurrent from Jason-1. For OSTM/Jason-2, there were neither specific System nor Satellite Phase A , the reason being the very strong heritage from the Jason-1 system and satellite definition.

The satellite phase B is essentially dedicated to assess the global definition of the satellite in terms of platform budgets and payload configuration and accommodation. A satellite Preliminary Definition Review (PDR) concludes this phase.

The satellite phases C and D are the classical phases which allow to fabricate , integrate and test the whole satellite.

Satellite phase C begins after the satellite PDR and ends before the integration and test phases with a satellite Critical Design Review (CDR)

Satellite phase D begins after the satellite CDR and ends when the satellite is ready to be shipped to the launch facilities. A Satellite Qualification Review (RQS) concludes this phase.

Satellite phase D includes the “Assembly, Integration and Test” (AIT) phases :

- payload AIT
- satellite AIT

Instruments have classical B/C/D phase definition. Instruments have to be available before the payload AIT phase.

The PIM has also to be available before payload integration.

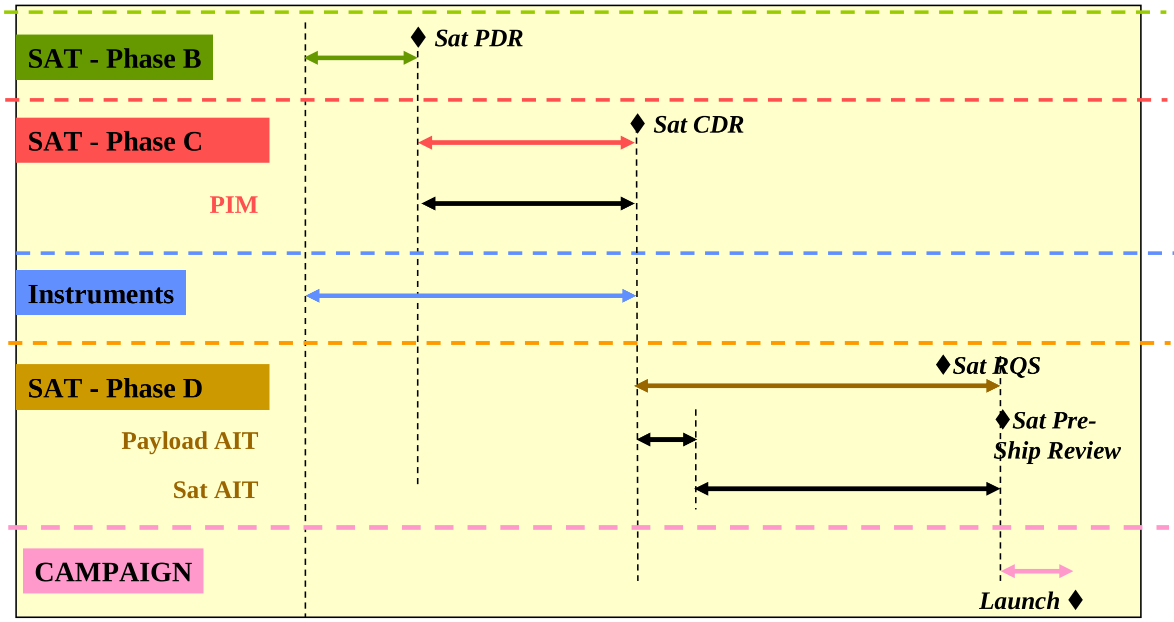
The payload AIT phase can begin when the platform, the PIM, the on-board software and at least one instrument are available. It ends when the payload is integrated and tested on the satellite.

The satellite AIT phase can begin when the payload AIT is finished and ends when the satellite is ready to be shipped to the launch facilities (end of phase D).

Before shipping the satellite to the launch facilities a Pre-ship Review takes place. The last phase before launch is the Launch campaign. This phase begins after the Pre-ship Review and ends with the satellite launch.

Reviews are described in Section 8.

The time frames for the phases are given in the OSTM/ JASON-2 SYSTEM MASTER SCHEDULE (AD16)



1.3.1.2 GROUND QUALIFICATION PHASES

Each ground element has to be developed or adapted by the element provider according to the responsibilities sharing defined in the OSTM/Jason-2 Memorandum Of Understanding (MOU). In these development phases each partner will have its own reviews. Classical acceptance meetings conclude each development phase.

As soon as several ground elements have been accepted the qualification phases can begin.

The Ground Qualifications Phases include :

The Technical Integration (IT) Phase begins with the first internal integration of NOAA or EUM or CNES housekeeping elements and ends when the NOAA and EUM and CNES housekeeping systems have been separately integrated. These integrations are managed independently.

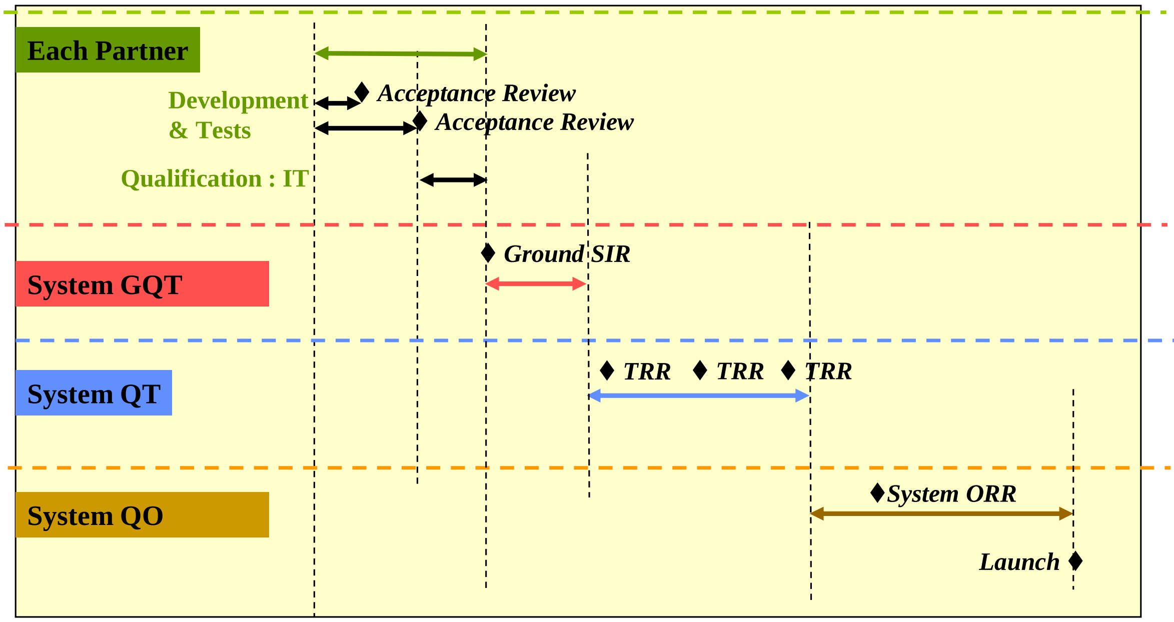
The Ground Technical Qualification (GQT) Phase begins with the first compatibility test between NOAA, EUM, CNES housekeeping elements. This phase allows to check the OSTM/Jason-2 Ground System (J2GS) interfaces (content structure, connections, transfer protocol, exchanges directories). Before this phase the "Ground System Interface Review" (SIR) will take place to verify the definition of all the ground interfaces and the readiness of each partner ground segment.

The Technical Qualification (QT) Phase begins when the main housekeeping elements of NOAA, EUM and CNES have passed the IT phase and the compatibility tests from the GQT phase . It consists in integrating together the NOAA, EUM and CNES elements, in checking that all the ground functions are performed and ends when the J2GS is technically qualified. This phase is performed without taking into account the operational constraints (like waiting for passes, …). Test Readiness Meetings (TRR) will take place before the QT phase and before each main test included in this phase

The Operational Qualification (QO) Phase can overlap the Technical Qualification Phase in time, beginning when the operations personnel will be trained in how to operate the computers and software of the J2GS and ending when mission operations personnel will demonstrate readiness to perform the mission. This phase includes an Operational Readiness Review (ORR).

Reviews are described in Section 8.

The time frames for the phases are given in the OSTM/ JASON-2 SYSTEM MASTER SCHEDULE (AD16)



1.3.2 MISSION PHASES

The OSTM/Jason-2 mission is conveniently divided into six phases, the objectives of each being as follows:

1. ***Launch and Early Orbit Phase (LEOP).*** The satellite is launched and maneuvered into injection orbit. Satellite and instrument systems are activated and checked out. The nominal duration of this phase is 3 days.

2. ***Orbit Acquisition Phase.*** The satellite is maneuvered into its operational orbit. This phase is concurrent with the Assessment Phase. The duration of this phase is about one month.

3. ***Assessment Phase.*** This phase begins at the end of LEOP and ends when:

    a. the satellite and instrument systems are functionally certified;

    b. the satellite is in its operational orbit; and

    c. the ground system is ready to operate routinely.

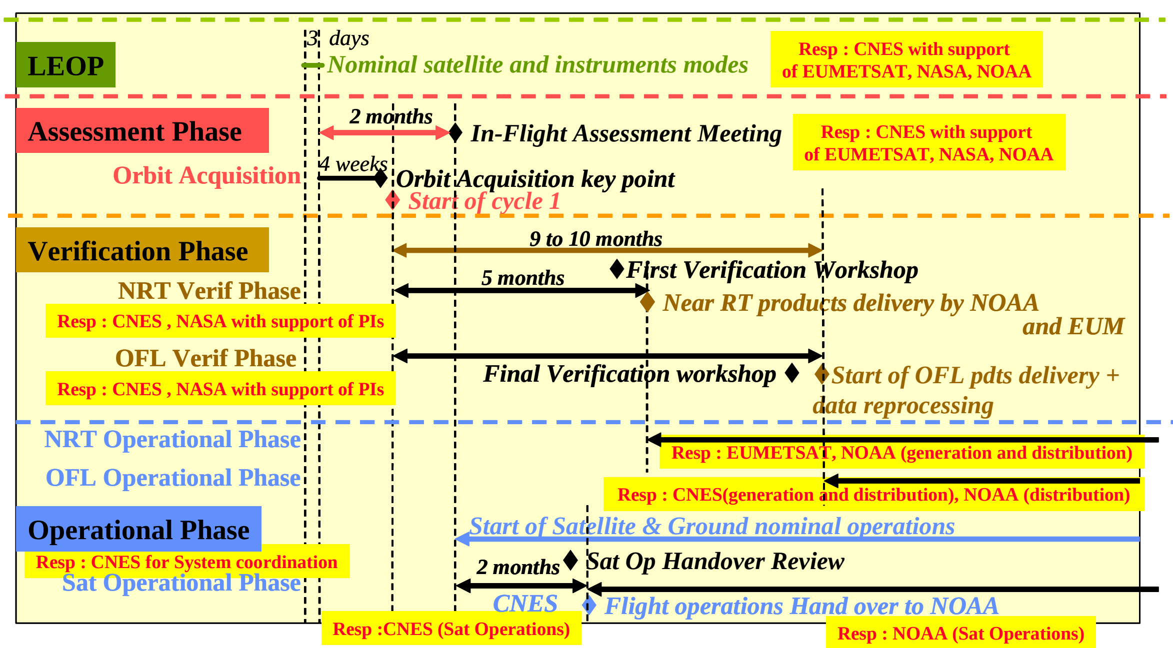
The duration of the assessment phase is 2 months.

4. ***Verification Phase.*** This phase overlaps the Assessment Phase in time, beginning when Jason-2 has reached its operational orbit (and is flying in tandem with Jason-1) , and continuing until the data received from the satellite, the instruments and the processing algorithms are satisfactorily calibrated and validated. During this phase, in situ data and laser ranging data will be collected from the verification site to be used in the

verification process. The duration and the activities of this phase greatly depend upon the availability or not of Jason-1 data at this date. A first verification workshop will be held 5 months after the beginning of the Verification Phase in order to assess the validation of the Near Real Time (NRT) products and to authorize the delivery of these products to the users. A final verification workshop will be held at the end of the Verification Phase (typically 4 months after the first workshop) in order to assess the validation of the Offline (OFL) products and authorize their release to the users. During the verification phase and before the workshop(s), data are distributed according to the decisions of the 4 partner Operational Coordination Group (to the Principal Investigators (PI's) or the Ocean Surface Topography Science Team (OSTST) members only).

5. **Initial Routine Operation Phase**. This phase begins after completion of the Assessment Phase and ends three years after launch. Instruments data are collected and monitored continuously. Science data products from the verification phase are reprocessed at the end of the Verification Phase using verified and calibrated algorithms.

6. **Extended Routine Operation Phase.** Assuming useful data are still being collected, this phase extends the mission an additional two years or any additional period that may be agreed by the OSTM/Jason-2 Partners. This phase will include end of life activities.



1.4 REFERENCE AND APPLICABLE DOCUMENTS

The OSTM/Jason-2 MOU (noted above) is the overarching document to which this Project Plan is responsive and is the authority to prevail should there occur conflicts within or with the interpretation of this document.

As separate documents will be issued to define in detail some of the topics addressed in this Project Plan, they will be considered as “applicable documents” and they will be called in the appropriate section of this Project Plan. These documents are shown in the Tables below.

1.4.1 REFERENCE DOCUMENTS

Index	Reference	Title of document
RD1		*OSTM/Jason-2 MOU : Memorandum Of Understanding among the “NASA” and the “NOAA”, jointly and the “CNES” and the “EUMETSAT” for Cooperation in the Ocean Surface Topography Mission*
RD2		*Cooperation Agreement between the “EUMETSAT” and the “CNES” concerning the European Contribution to the Ocean Surface Topography Mission*

1.4.2 APPLICABLE DOCUMENTS

Index	Reference	Title of document
AD1	TP3-J0-STB-116-CNES	*OSTM/JASON-2 OPERATIONAL SERVICE SPECIFICATION*
AD2	TP3-J0-STB-44-CNES	*OSTM/JASON-2 SYSTEM REQUIREMENTS*
AD3	TP3-CUSP-20-CNES	*JASON-2 Payload Instruments Deliverables Item List*
AD4	TP3-JS-STB-110-CNES	*OSTM/JASON-2 GROUND SYSTEM REQUIREMENTS, ARCHITECTURE AND OPERATIONS CONCEPTS*
AD5	TP3-J0-NT-220-CNES	*OSTM/JASON-2: CNES/EUMETSAT Deliverables Item List*
AD6	TP3-J0-NT-221-CNES	*OSTMJASON-2: CNES/NOAA Deliverables Item List*
AD7	TP3-J0-STB-197-CNES	*OSTM/JASON-2 System Test requirements*
AD8	TP3-LB-SP-33-CNES	*JASON-2 Satellite Integration and Test Organization*
AD9	TP3-J0-PL-222-CNES	*OSTM/JASON-2 CAL/VAL plan*
AD10	TP3-J0-SP-188-CNES	*OSTM/JASON-2 SCIENCE AND OPERATIONAL REQUIREMENTS*
AD11		*JASON-2 SAFETY PLAN*
AD12		*OSTMJASON-2: NASA/NOAA Deliverables Item List*
AD13	TP3-J0-NT-87-CNES	*OSTM/JASON-2 ENGLISH/FRENCH GLOSSARY OF TERMS AND ACRONYMS*
AD14	TP3-J0-AQ-139-CNES	*OSTM/JASON-2 4 PARTNER MISSION ASSURANCE POLICY*

Index	Reference	Title of document
AD15	TP3-J0-GP-214-CNES	*OSTM/JASON-2 4 PARTNER CONFIGURATION MANAGEMENT POLICY*
AD16	TP3-J0-PL-133-CNES	*OSTM/ JASON-2 SYSTEM MASTER SCHEDULE*
AD17	TP3-J0-NT-187-CNES	*OSTM/JASON-2 MISSION ANALYSIS*
AD18	TP3-J0-GP-103-CNES	*OSTM/JASON-2 4 PARTNER DOCUMENTATION TREE*
AD19	TP3-LB-SP-21-CNES	*JASON-2 SATELLITE REQUIREMENTS*
AD20	TP3-CU-SP-32-CNES	*JASON-2 PAYLOAD INTEGRATION AND TEST REQUIREMENTS*
AD21	TP3-JS-IF-200-CNES	*OSTM/JASON-2 GROUND SYSTEM INTERFACES*
AD22		*JASON-2 SAFETY ANALYSIS*
AD23		*JASON-2 MISSION SPECIFICATION (BOEING MISSION SPECIFICATION)*
AD24		*JASON-2 SPACECRAFT QUESTIONNAIRE*
AD25		*LAUNCH SITE SUPPORT REQUIREMENTS AND LIST*
AD26		*LAUNCH SITE OPERATION PLAN*

1.5 TERMINOLOGY AND ABBREVIATIONS

See OSTM/Jason-2 acronyms document (AD13)

2. OSTM/JASON-2 PROJECT CONSTRAINTS AND LEVEL 1 REQUIREMENTS

The following requirements/constraints are applied to the OSTM/Jason-2 project:

1. The Memorandum Of Understanding co-signed by CNES, EUMETSAT, NASA and NOAA defining the general responsibilities of the partners and the terms and conditions under which they have agreed to cooperate in OSTM/Jason-2.
2. The use of the generic PROTEUS platform as the satellite platform with minimized adaptations.
3. The development of a new set of instruments, with obviously a large heritage from Jason-1 but also with the aims to reduce mass and/or power consumption, to increase availability and ease the operations.
4. The use of a US launch vehicle compatible of the PROTEUS platform.
5. The use of the PROTEUS generic ground segment (Control Center and one Earth Terminal) adapted to OSTM/Jason-2.
6. The use of the multi mission center “Segment Sol Multimission Altimétrie et Orbitographie“ (SSALTO) already operating for Jason-1, Topex/Poseidon, DORIS /SPOT, DORIS/ Envisat and Envisat altimeter data processing and distribution, as CNES mission center.
7. The re-use of the NASA Jason-1 ground system (JTCCS) as a baseline for developing the OSTM/Jason-2 ground system for the Satellite Operation Control Center (SOCC) at NOAA
8. The launch date set around June, 2008.

The high level requirements put on the OSTM/Jason-2 project are expressed in the documents « OSTM/Jason-2 Operations Service Specification » (AD1) , « OSTM/Jason-2 System Requirements » (AD2) and «OSTM/Jason-2 Science and Operational Requirements » (AD10).

These documents provide detailed requirements on mission success, science requirements and goals, mission requirements, orbit, launcher, operations, products definitions and delivery, satellite and instruments requirements, pointing, precise orbit determination, data storage and content, time tagging, ...

Among all these requirements necessary for the conduct of the mission, Level 1 Requirements can be highlighted as the key requirements driving the success of the mission. They are listed below :

1. Provide a minimum of 3 years measurement of ocean surface topography
2. Launch on the same orbit as Jason-1
3. Fly within +/- 1 km of the same 9.9-day repeating ground tracks as Jason-1.
4. Maintain at least the same measurement accuracy than Jason-1 : 3.4 cm (rss; for a typical sea of 2 m significant waveheight and 11 dB sigma0) at 1/sec along-track data rate with a goal of achieving 2.5 cm (RSS) as defined in AD10.
5. Maintain the stability of the global mean sea level measurement with a drift less than 1 mm/year over the life of the mission according to AD10.
6. Maintain the accuracy of significant waveheight to 50 cm or 10% of the value (whichever is greater), sigma0 to 0.7 dB according to AD10.
7. Minimize any relative bias from Jason-1 to less than 5mm.
8. Conduct a verification phase of the mission of at least 10 months to calibrate and validate the mission’s measurement system. During this phase, if Jason-1 is still functioning, orbit phasing of Jason-2 shall

be made to ensure near simultaneous observations with Jason-1 with a time separation less than 10 minutes, with one minute as a goal.

9. Return from the satellite to the ground for processing more than 95% of all theoretically possible data that can be collected in a three-year period

10. Process all recovered over-ocean data obtained during any 12-month period, with no-systematic gaps, into Geophysical Data Records and make data available to the user community.

11. At the completion of the verification phase deliver the Operational Geophysical Data Record (OGDR) , the Interim Geophysical Data Record (IGDR) and the Sensor / Interim Geophysical Data Record (S-IGDR) , and the Geophysical Data Record (GDR) and the Sensor / Geophysical Data Record (S-GDR) according to the data latency given in AD1.

12. Maintain at least the same content, accuracy and timeliness of information in the Near Real Time Products and Offline Products as Jason-1.

The Mission will be judged successful if, at a minimum, the following success criteria are accomplished:

- Achieve a successful launch and the required mission orbit
- Support the long-term ocean surface topography measurements began by TOPEX/Poseidon, with the measurement accuracy of at least 3.4 cm given in AD10, with a mission duration of at least 3 years.
- Capture, process, and deliver the Near Real Time Products for archive and distribution to the user community.
- Capture, process, and deliver calibrated Offline Products for archive and distribution to the user community.

3. MISSION MANAGEMENT

3.1 MISSION OVERALL ORGANISATION

The overall organization of the OSTM Program relies on the following entities and their relationship:

At the level of each participating agencies:

- A **Program Office** is in charge of the programmatic follow up of the program and any matter dealing with international cooperation, coherence with other Earth observation programs, and legal affairs. The Program office shall also be part of all discussions, and decisions on subjects having a major impact on the OSTM program, that is to say potentially bringing the project outside from the defined schedule, budget or performance envelope. The Project Office periodically reports its activities to the Program Office according to internal agencies frequency and rules.
- A **Project Office,** led by a Project Manager, is in charge of all activities regarding development, preparation of operation and mission operation all along the mission lifetime. This Project Office is responsible for the development and operation part of the OSTM system according to the agreed sharing of responsibilities between partners and also according to budget, schedule and performances as defined in the Program Proposal approved by each partner and described in the system documentation. The detailed organisation of this Project Office is under the responsibility of each agency according to its internal management rules. The Project office team shall include or get support on all engineering and management skill deemed necessary in view of the tasks to be accomplished. The project office organization shall clearly identify the people who will be in charge of managing interfaces with partners. The interactions (telecon, meeting etc..) between each project team are described in paragraph 10.3.

The detailed relationship and responsibility sharing between Program and Project Office is very much dependent upon each agency organization and as such can not be given in detail here. This shall be described in each internal Project Management plan.

At the level of the four partners:

- A **Joint Steering Group** (JSG) whose responsibilities and organizational rules are given in paragraph 3.3
- A **Science Team** whose membership and role is given in paragraph 3.4

At bilateral level:

- There will be specific bilateral relationship between the partners, especially when hardware and/or software are exchanged between those. These relationships will be described through dedicated cooperation agreement as it is the case between EUMETSAT and CNES or through any other documentation deemed adequate. These bilateral agreements will be given for information to the other partners. In case of conflict or contradiction between these agreements and the MOU, the MOU shall prevail. The detailed management of deliveries between partners is described in Chapter 11.

3.2 DIVISION OF RESPONSIBILITIES

The division of responsibilities for the OSTM/Jason-2 mission is similar to Jason-1, taking into account the addition of EUMETSAT and NOAA. The main features are given below.

- **NASA responsibilities:**
  - Project Management
  - Launch vehicle
  - Payload
    - Advanced Microwave Radiometer (AMR)
    - GPS Receiver (GPSP)
    - Laser Retroreflector Array (LRA)
  - JPL Payload integration and test
  - Mission Operation support for JPL instruments
- **NOAA responsibilities:**
  - Project Management
  - Ground System & Operations
    - Satellite Operations Control Center (SOCC)
    - CDA Stations (2)
    - NRT product processing
    - All product distribution
    - All archiving
    - Ground network
    - Satellite operations after handover
  - User interface
- **CNES responsibilities:**
  - Project Management
  - Satellite, Proteus bus
  - Payload
    - Nadir Altimeter POS3
    - DORIS tracking receiver package with CARMEN2 - T2L2 - LPT
  - Ground System & Operations
    - Satellite Control Command Center (CCC)
    - OFL product processing and distribution
    - All archiving
    - Ground network
    - Satellite Operations before handover
    - Navigation, Guidance, Expertise for all mission
  - System integration & test
  - Mission Operation support for spacecraft bus and CNES instruments
  - System Coordination for all mission phases
- **EUMETSAT responsibilities:**
  - Project Management
  - Ground System & Operations
    - Earth Terminal (1)
    - NRT product processing, archiving and distribution
    - Ground network
  - User interface

Detailed responsibilities are described for every product/document and for each phase in paragraphs 4 to 11.

3.3 JOINT STEERING GROUP

As required by Article VIII of the MOU “Program and Project management”, the partners will establish an OSTM Joint Steering Group (JSG) to provide guidance for the mission. Composition and main duty of the JSG are given in the MOU.

The JSG, which also serves as the steering committee for the level 1 system reviews (as defined in the section 8), will ensure that representatives from all Partners, or each Partner’s designees, are invited to serve on the boards of these reviews. The JSG will be co-chaired by NASA and CNES during mission development, until handover of satellite operations, and by NOAA and EUMETSAT following handover of the satellite operations and control functions.

There can be several reasons to convene a JSG meeting.

a) As Steering Committee of a mission/system review as detailed in the Review management section (section 8)

b) As a periodic meeting (once per year) in case there are no mission/system reviews

c) In case of disagreement among the Project and /or Program Managers on a dedicated subject

d) When a decision potentially impacting the mission success criteria or Level 1 requirements and/or adversely affecting the risk ranking as defined through the risk assessment process has to be made timely, outside from a review process.

The JSG meeting can either be a face to face or telecon meeting. In view of anticipated difficulties to find meeting dates affordable by the representatives from the four partners and in order to avoid postponement of urgent decisions, it shall be possible to convene a JSG meeting (face to face or telecon) with the participation of only one representative from each partner.

The attendance of the JSG, in addition to permanent members as listed in the MOU, shall be adapted to the items to be discussed and decisions to be made. Experts on the domain to be considered can be invited to attend a JSG. The list of proposed experts shall be exchanged and approved by the partners. When the JSG meets as Steering Committee for a system review, the review board chairman, assisted by member(s) of the board if necessary is invited to the Steering committee meeting where he will present the review board report.

An agenda of the JSG shall be released by the agency hosting the meeting or convening the telecon sufficiently in advance to be approved by the partners. A summary of actions/decisions taken during the meeting shall also be released by the convening agency and these actions shall be included in the project system action list..

As indicated in the MOU, the JSG decision shall be taken by consensus. If agreement can not be found among the JSG members, Article XXIII “Settlement of Dispute” of the MOU will apply.

The JSG members approve two level 1 documents of the project : These documents are the “Project Plan” and the “Operations Services Specification” (AD1).

3.4 SCIENCE TEAM

The Ocean Surface Topography Science Team (OSTST), co-chaired by the Project Scientists, includes all Principal Investigators (PIs) selected by EUMETSAT, CNES, NASA and NOAA, plus the Project and Program Scientists. The OSTST will advise the Project on aspects of the mission that influence the scientific and operational usefulness of mission data. The interests of the team include: definition of products (near real time, offline and experimental), algorithms for processing the data, plans for verifying and calibrating the data, system design for processing and distributing data, data format, and plans for calculating and verifying a precise ephemeris.

Before launch, the OSTST works with the agencies to assist and guide the Project in the design of the OSTM/Jason-2 Mission and the definition of its output products. After launch, the OSTST has the responsibility for demonstrating the scientific and operational utility of the data to the international research and operational community.

The OSTST will also establish the criteria and guidelines necessary to ensure that the data are used by the PIs in a scientifically useful and effective manner.

The OSTST assists the Project in definition of Project/Science requirements and interfaces. It participates in dedicated “science” reviews to coordinate science requirements, and to advise the Project on mission decisions and the way they affect the science objectives and investigations. The OSTST assists and advises the Project in identifying, planning, coordinating, and conducting data verification activities.

The OSTST jointly discusses and coordinates data analysis techniques and methods, and the publication of the scientific results of investigations relating to the mission. The OSTST communicates and coordinates plans and progress to related international programs.

Because the OSTST is large and meets infrequently (once per year in plenary session), it is better suited to provide general scientific guidance than specific timely advice. To obtain timely answers for day-to-day scientific problems or any critical point whose adequate answer shall be timely given and shall not wait until the next OSTST meeting, the Project will rely on the advice of the Project Scientists. It is up to the Project Scientists, before giving advice to the project, to consult part or all of the members of the OSTST. This consultation will be mainly based on e-mail exchange. This will also be the case in preparation for any decision regarding the OSTST domain of interest that needs to be brought to the attention of the JSG. In such a case, the Project Scientists assisted if deemed necessary by PI’s representatives will attend the JSG.

3.5 PROJECT STAFF

3.5.1 CNES PROJECT STAFF

3.5.1.1 PROGRAM MANAGER

The CNES Program Manager, within the Division Observation de la Terre in the Direction des Programmes at CNES, is designated to direct the activities of OSTM/Jason-2 in relation with the CNES Earth Science Program. This Program Manager is responsible to the “Directeur des Programmes” of CNES for assuring that all science goals and requirements established for the Project are met within available resources. The CNES Program Manager is responsible for the overall programmatic contribution of CNES to OSTM/Jason-2.

3.5.1.2 PROJECT MANAGER

The CNES Project Manager is assigned by CNES to provide funding and planning and technical control of the CNES portion of the Project, to report at CNES to the CNES management and to the Direction des Programmes and to coordinate and act with the 4 partner OSTM/Jason-2 Project Managers on all matters which impact overall mission schedule, cost or performance.

The Project Manager is responsible for the French part of the OSTM/Jason-2 activities from definition studies phase till the end of the science verification phase.

3.5.1.3 PROJECT MISSION SCIENTIST

The CNES Project Scientist assists and advises the Project Manager on the scientific mission.

The Project Scientist is responsible for maximizing the scientific return within Project constraints. The Project Scientist co-chairs the Ocean Surface Topography Science Team (OSTST) along with the mission scientists from the other partners and is the primary contact between the PIs and the Project.

The Project Scientist will be responsible for coordinating :

- pre- and post-launch science investigations, assisting planning and conducting of validation activities, and coordinating with the Project for the data production and dissemination activities.

- science requirements, plans, and field experiments with other organizations, whether private, academic, Federal, national, or international.

The Project Scientist will evaluate all scientific requirements and goals, reviewing the Project implementation to ensure that the overall mission approach is consistent with the science objectives.

The Project Scientist conducts, together with NASA, the preparation and release of relevant OSTM/Jason-2 Research Announcements and, in coordination with EUMETSAT, the selection of European Investigators

3.5.1.4 MEASUREMENT SYSTEM ENGINEER

The CNES Measurement System Engineer is in charge of the definition of the data products and of the processing algorithms. For these activities he works in close relationship with the project scientists and the OSTST teams. He leads the data product performance verification activities, and the processing algorithms evolutions definition.

His role is as follows:

- iterate with the Project Scientists to form the product and algorithm review team,

- co-chair the product and algorithm review team with the NASA, NOAA and EUMETSAT MSE , which means prepare and hold review meetings, and be sure that conclusions are transferred to the OSTST in order to define OGDR, IGDR and GDR ,

- understand all core mission sensors onboard Jason-2: serve as liaison to the NASA MSE for understanding POSEIDON-3 and DORIS and interact with him for AMR and GPSP instruments,

- define all altimeter science algorithms, provide input, review and concur to NASA definition of radiometer algorithms,

- perform specifications of all algorithms, ensure that a complete and consistent set of algorithm and instrument constants are made available to the processing system,

- contribute to the OSTM/Jason2 CALVAL working group activities, by contributing to the organisation of the group and soliciting input from OSTST investigators,

- contribute to the establishment of a joint CNES/NASA/NOAA/EUMETSAT CALVAL plan,

- contribute to global product and algorithm verification, ensure that CALVAL results are translated into processing software, and respond to questions from OSTST members on algorithms, data, instruments

3.5.1.5 SYSTEM MANAGER

The CNES System Manager reports directly to the Jason-2 Project Manager.

The System Manager is in charge of all the system definition activities (system definition, operational and scientific products specification, ground system requirements), and of the interfaces coherency between the first level components (in particular the satellite and the ground system). The System Manager is responsible for the mission analysis activities, for the global performance of the system, and is the leader for the system validation activities (technical and operational qualification of the system).

The System Manager is responsible for activities coordination with NASA, EUMETSAT and NOAA at system and ground system level.

The System Manager coordinates the CNES "System and Operations" group. This Group is in charge of the system performance follow on and verification, of the Ground System activities and the Operations preparation.

3.5.1.6 SYSTEM ASSURANCE MANAGER

The CNES System assurance manager is in charge of all the mission assurance activities at system level, including ground system activities. The System assurance manager is in particular responsible for the non conformances control and the risk management activities, and is in charge of the synthesis of the mission assurance activities at project level.

During the system test phase, the System assurance manager is responsible for organizing for each test the Test Readiness Reviews and the Post Test Reviews.

3.5.1.7 PAYLOAD AND LAUNCHER INTERFACE MANAGER

The CNES Payload and Launcher Interface Manager reports directly to the Jason-2 Project Manager.

The Payload and Launcher Interface Manager is responsible for the coordination of the Payload group which is in charge of the Jason-2 instruments development

The Payload and Launcher Interface Manager is in charge of all the Payload level activities (definition, coherency and configuration, budgets, qualification, schedule …) and is responsible for activities coordination with NASA at instrument and satellite level. He is responsible for providing the Satellite Manager with all the necessary information about the payload instruments to perform the development, test and qualification of the satellite.

The Payload and Launcher Interface Manager coordinates launcher activities with NASA including safety aspects and Launch Campaign activities.

3.5.1.8 SATELLITE MANAGER

The CNES Satellite Manager reports directly to the Jason-2 Project Manager.

The Satellite Manager is responsible for the satellite development including the satellite qualification, integration and tests, according to the PROTEUS platform features and taking into account the Jason-2 specificities. He is responsible for the satellite prime contractor contract.

For these activities the Satellite Manager is supported by the CNES experts from the PROTEUS team, by the satellite assurance manager and by the Payload and launcher interface manager.

3.5.1.9 SATELLITE ASSURANCE MANAGER

The CNES Satellite assurance manager is in charge of all the mission assurance activities at satellite and payload level. In fulfillment of this role his responsibilities include reliability, Electronic Parts, Materials, Quality Assurance, System Safety and Qualification programs. In particular he participates to the management of anomalies, waivers and deviations at satellite and payload level, participates to the payload instruments Delivery Review Boards, to the Test Readiness Reviews and Post Test Reviews during the Payload and Satellite AIT.

He is charge of the synthesis of the mission assurance activities at satellite level. He is supported by the Cnes quality experts and by the Systems Safety engineer.

3.5.1.10 PAYLOAD ENGINEER AND I&T MANAGER

The CNES Payload Engineer and I&T Manager is in charge of the technical expertise on all payload interface aspects and in particular to check the compliance of the instruments with the Interface and I&T requirements.

He is responsible for the definition of the Payload I&T Requirements and for coordinating the definition and operation of the payload instrument EGSE during the satellite AIT.

He supervises I&T activities in behalf of CNES project team. He attends tests planning meetings and key-points and is responsible for coordinating any CNES required technical support. He reviews the test requirements ("Demandes d'essais"), test procedures and test reports and is involved in the process of corrective actions decision in case of changes, deviations or any problem encountered during the I&T program.

3.5.1.11 CNES PAYLOAD INSTRUMENTS MANAGERS

Each of the CNES instruments (POSEIDON3, DORIS, T2L2, CARMEN2) , has a lead engineer assigned with the following responsibilities:

- define the instrument functional requirements and design specifications taking into account the satellite interface constraints,

- lead the development, integration, test and calibration of flight hardware, support equipment, and related software,

- prepare the instrument integration activities on the spacecraft.

- is responsible for the instrument schedule and for the instrument scientific performances.

3.5.1.12 GROUND SYSTEM MANAGER

The CNES Ground System Manager is responsible for establishing the OSTM/Jason2 Ground System Architecture and Operation Requirements, as well as the interfaces between all the ground system elements.

He is responsible for coordinating the team in charge of the definition, implementation and validation of the CNES elements of the OSTM/Jason2 ground system. He shall ensure the maximum reuse of the existing Jason-1 ground system.

He participates in the ground system validation activities and in the preparation of the operations.

3.5.1.13 SYSTEM TESTS MANAGER

The CNES System Tests Manager is responsible for the definition and the implementation of the system tests plans (compatibility tests between the different system elements, satellite/ground tests, routine operation tests, general rehearsals). He will ensure that the means and tools necessary for these tests are available.

He is responsible for coordinating the different teams involved in the system tests (CNES internal teams and teams from EUMETSAT, NASA and NOAA).

3.5.1.14 MISSION OPERATION MANAGER

The CNES Mission Operation Manager is responsible for preparing the OSTM/Jason2 mission operations . For that, he prepares the operations documentation, ensures that all the necessary means are available, and coordinates the operations teams for preparing and running the operational qualification tests and the in-flight assessment tests.

3.5.2 EUMETSAT PROJECT STAFF

3.5.2.1 PROGRAM MANAGER

The EUMETSAT Program manager is responsible of the overall programmatic contribution of EUMETSAT to OSTM/Jason-2. The Program manager is one of the two EUMETSAT representatives to the JSG and to the J2-JSG and is interfacing between the project and the EUMETSAT delegate bodies.

3.5.2.2 PROJECT AND SERVICE MANAGER

The EUMETSAT Project and Service Manager is responsible for managing the contribution of EUMETSAT to the deployment, verification and operations of the OSTM/Jason-2 system, and the related interactions with the OSTM programme partners. The Project and Service Manager reports to the Director of the Operation Department and will be an integrated member of the EUMETSAT operations management team.

3.5.2.3 PROJECT MISSION SCIENTIST

The EUMETSAT Mission Scientist will serve as Jason-2 Mission Scientist as part of his global responsibility of EUMETSAT Ocean Mission Scientist providing scientific expertise in the field of oceanography and remote sensing of the ocean with focus on altimetry and scatterometry. The Mission Scientist will co-chair the OSTST along with the mission scientists from the other partners. The Mission Scientist will support the OSTM/Jason-2 Research Announcement, in cooperation with the other partners, assess the relevance of research to the development of operational applications, and organize the dialogue between the research and operational user communities, with a view to stimulating the transfer of research results to operations. The Mission Scientist will represent EUMETSAT in international for addressing the use of meteorological satellites in oceanography. He will also act as the EUMETSAT Measurement System Engineer.

3.5.2.4 ENGINEERING TEAM LEADER

The EUMETSAT Engineering Team Leader will be coordinating the team in charge of the definition, implementation and validation of the EUMETSAT Jason-2 ground system, which will host the CNES provided elements and interface and communicate with the other ground system elements through the network. The Engineering Team Leader shall ensure a maximum re-use of existing EUMETSAT infrastructure and that the Jason-2 ground system operations are adequately integrated in the overall EUMETSAT structure.

3.5.2.5 OPERATION/PRODUCT ENGINEER

The EUMETSAT Operation/Product Engineer will be responsible for the operational qualification and testing of the EUMETSAT Jason-2 ground segment and its interfaces within the overall OSTM/Jason-2 ground system. The Operation/Product Engineer will then be in charge of the coordination of OSTM/Jason-2 operation and product validation and production at EUMETSAT.

3.5.3 NASA/JPL PROJECT STAFF

The NASA Program Manager or Program Executive (PE) within the Earth-Sun System Division at NASA-HQ is designated to direct the activities of OSTM within NASA. The PE is responsible to the director of the Earth-Sun System Division within the NASA Science Mission Directorate for assuring that all science goals and requirements established for the Project are met within available resources. The PE is responsible for the overall programmatic contribution of NASA to OSTM.

The Project Manager (PM) is responsible for the overall success of the NASA contributed project elements. The PM is responsible for design, development, test, mission operations of all NASA elements, and for coordination of the work of the contractors. The PM programmatically reports to the NASA-JPL Director for Earth Science and Technology Directorate. The PM informs JPL, NASA, and 4 partner management on the status and progress of the project, and coordinates with other organizations involved in or supporting project activities. The PM works with the partner project managers on all matters which impact overall mission schedules, cost or performance.

The project scientist is responsible for the scientific integrity and overall scientific success of the project. scientific integrity and overall scientific success of the project. The OSTST will be co-chaired by the Project Scientist along with the mission scientists from the other partners. It includes representatives from NOAA and EUMETSAT, and the investigation scientists.

The NASA Headquarters Program Scientist for OSTM will provide for the solicitation, selection and balance of the Ocean Surface Topography Science Team. The Program Scientist assures that the mission science is effectively integrated with that of related research and missions, and that key areas of calibration/validation and data management are reflected in project plans. The Program Scientist will participate in and, where appropriate, provide scientific leadership to the international science/mission activities involving interaction of NASA with its interagency and international partners.

The Project Scientist will:

- Ensure that the Level 1 science requirements are met. Lead the development of Project-level science requirements. In all phases of the project (formulation, implementation, and operations), provide expert interpretation of the science requirements for the project.
- Collaborate with the Project Manager on all issues affecting the scientific success of the project, and respond in a timely manner to requests from the Project Manager for advice or assessment of science-related issues.
- Maintains oversight of the scientific aspects of all phases of the project.
- Ensure that the scientific return of the project is maximized within the project constraints.
- Represent the Scientific Investigators of the mission to the Project and to NASA.

The System Engineering Manager (SEM) is responsible for overseeing and advising the Project Manager on matters related to project-wide systems engineering, requirements allocation and flow-down, Project Plan development, mission design and navigation, launch vehicle integration and launch services, range safety, and other such systems level tasks. The System Engineering Manager provides technical support to the Project Manager and is accountable to him for assessing the system compliance with requirements, at large, and the ability of the OSTM system to achieve mission success and meet the science objectives. He also supports all 4 partners in identifying and solving system level trades, issues or problems.

The SEM leads the Project-level systems engineering team supported by the Launch Vehicle Integration Engineer, Payload Systems Engineer, Configuration Management Engineer, Instrument Engineers, and Integration and Test Manager) and any other project support elements including system contractors. The SEM also implements the project risk management process and works with the project manager to track and manage risks at the project level.

The Payload System Engineer (PSE) will manage the OSTM Payload level requirements and interfaces, provide technical leadership for interface definition, and manage the trade studies for risk mitigation. For OSTM the Payload refers to the three NASA instrument (AMR, GPSP, LRA). The PSE is responsible for instrument level design, requirements development and flowdown, trade studies and baseline definition, partitioning the payload to Instruments, subsystems and elements, development and maintenance of the margins and allocation process, and technical coordination. The PSE is the primary technical interface with regards to Instrument development, integration, interfaces and operation. The PSE works with the instrument engineers and I&T manager to coordinate; Payload Requirements, Validation, and Verification, Payload Design and Compatibility, Payload Performance and Analysis, Payload Accommodation.

The Business Manager will oversee performance management, contract management, resource management and all other activities related to the business aspects of the Project.

The Mission Assurance Manager is responsible for assuring mission success for all aspects of the project, and will coordinate with the partners' product assurance office. The Mission Assurance Manager (MAM) reports to the Project Manager. Responsibilities of the MAM include : designing the Reliability, Electronic Parts, Materials, Quality Assurance, System Safety and Environmental Qualification Programs. During the implementation phase of instrument development, the MAM is responsible for the management of the aforementioned activities

The System Safety Engineer (SSE) provides Flight Project technical safety by identifying, assessing, and mitigating risk to personnel or critical hardware. The SSE supervises and maintains the technical aspects of the OSTM Systems Safety Program. The SSE co-chairs, together with Project Manager, Safety Steering Committee Meetings to resolve safety concerns, review safety documentation and guide the Program in its' safety endeavors. The SSE also supports JPL, Contractor and (as applicable) partner design/ test/ operations, evaluates contractual safety documents, reviews and approves hazardous operations procedures. The SSE also consults with NASA Headquarters and other NASA Centers in the development and review of safety related requirements and documents.

The Launch Vehicle Integration Engineer (LVIE) is delegated by the JPL Project Manager as responsible for the Management of the launcher and launch support contract. He is the contact point between NASA-KSC/Boeing and the Project during the Project development and launch campaign. He is responsible for the preparation of the documentation associated with the Delta II launch. He will review/approve technical documents passing between the Project and Boeing. Examples are Mission specification, Interface Control Document, safety submissions, mission analysis input files, test plan, launch campaign documents, and post-launch documentation. The LVIE is in charge of assessing the compatibility between the satellite and Delta II. He is responsible for launch integration meeting organization, and he works with the CNES Launcher/Satellite interface engineer and with the Satellite I&T manager on LV - Satellite integration.

Each of the NASA instruments (AMR, GPSP, LRA) has a lead engineer assigned with the following responsibilities:

- Prepare the instrument functional requirements and design specifications.

- Establish interface agreements regarding the instrument and other applicable hardware on the host spacecraft.

- Lead the development, integration, test and calibration of flight hardware, support equipment, and related software.

- Keep the Project Manager and line managers informed concerning status and progress, and solicit assistance in solving problems. When the instrument development requires a significant contracted effort, the Instrument engineer may also function as a Contract Technical Manager (CTM). If the size of the subcontract requires a dedicated CTM, the Instrument Engineer will partner with the CTM to ensure that there is beneficial impact from the contractor's performance.

3.5.4 NOAA PROJECT STAFF

3.5.4.1 NOAA POLAR PROGRAM MANAGER

The NOAA Polar Program Manager will coordinate the NOAA OSTM/Jason-2 Project within the overall Polar Program within the Office of Satellite Development (OSD). This involves determining the budget, allocating resources, and advising the Jason-2 project working group of cross-project schedule and resource dependencies. The NOAA Polar Program Manager serves as the NOAA point of contact with the other Parties regarding NOAA's role in achieving mission milestones. In fulfilment of this role, the Program Managers responsibilities include:

- Defining the nature of NOAA's participation in the achievement of the Milestones,
- Communicating the nature of that participation to the co-leads, OSD management, and the managers of NOAA departments contributing resources to the working group,
- Acquisition of (NOAA) internal and (contractor) external resources
- Resolving cross-NOAA issues that might delay the achievement of a milestone,
- Representing NOAA's position to the other MOU Parties on issues relating to NOAA's role in the achievement of these milestones

3.5.4.2 PROJECT MANAGER

The NOAA OSTM Project Manager ensures the fulfilment of NOAA's responsibilities according to the terms of the OSTM Four Party Memorandum of Understanding (MOU) (RD1). These include system engineering, definition of program requirements, operations and operational support (including facilities), and delivery of user products. The Project Manager defines the means of implementing program requirements, establishes milestones and schedules, and assembles, justifies, and presents program and budget information for implementing approved polar programs.

- The OSTM Project Manager's responsibilities include:
- Preparation and implementation of the NOAA OSTM/Jason-2 System Project Plan
- Managing activities of the OSTM Ground Systems Working Group
- Coordination of NOAA's contributions to 4-party documents
- Coordination of NOAA's participation in 4-party design reviews
- Coordination of development and maintenance of operations concept
- Coordination of NOAA-only document development
- Coordination of NOAA-only design reviews
- Preparation of NOAA's budget input for upgrading the Polar Ground Segment
- Coordination of configuration changes between NOAA and the other 3 parties (NASA/JPL, EUMETSAT, and CNES)

3.5.4.3 GROUND SYSTEM IMPLEMENTATION MANAGER

The Ground System Acquisition and Implementation Manager 's responsibilities include:

- Co-leadership and management of the OSTM Ground Systems Working Group
- Coordination of satellite-to-ground Interface Requirements Documents (IRDs), including development of interfaces from NOAA to external Earth Terminals (ET)
- Implementation activities of ground segment upgrades
- Integration and Test activities of NOAA Polar Ground System to support OSTM/Jason-2
- Definition and implementation of Ground System operating procedures in support of the Jason-2 satellite and the OSTM
- Requirements monitoring, tracking, and change control

- Obtaining any ground personnel operational training and documentation requirements

3.5.4.4 PROJECT MISSION SCIENTIST

A representative from the Office of Research and Applications (ORA) is assigned as the OSTM/Jason-2 Mission Scientist. The Mission Scientist:

Prior to operational handover:

- Provides input to CNES and JPL on the development of algorithms to be incorporated with the product processing systems
- During the assessment phase, provides assistance with instrument calibration/validation and satellite navigation and orbit determination for Jason-2 satellite orbital data streams

After operational handover

- Support CNES validation activities for the products generated by the product generation software
- Assist Office Satellite Data Processing and Distribution (OSDPD) / Environmental Satellite data Processing Center (ESPC) with implementation and operations of NRT products' quality assessment software.

He will also act as the NOAA Measurement System Engineer.

3.5.4.5 OPERATIONS ENGINEER

A representative from the Office of Satellite Operations (OSO) is assigned as the OSTM/Jason-2 Operations Engineer. The operations Engineer:

- Oversees the operation of Jason-2 satellite on a 24 hour per day, seven days per week basis
- Leads activities for preparation of Operational Requirements
- Monitors acquisition projects for integration into ground segment elements operated by Office of Satellite Operations (OSO)
- Is responsible for interfacing with both the Scheduling and Operations personnel within OSO.
- Is responsible for addressing daily ground system issues and testing that are needed.
- Supports and participates in verification and validation activities.
- Is responsible for the operational qualification and testing of the NOAA Jason-2 ground segment and its interfaces within the overall OSTM/Jason-2 ground system.

3.5.4.6 NRT PRODUCT ENGINEER

A representative from the OSDPD will serve as OSTM Near Real Time Processing Engineer. This Near Real Time Processing Engineer is :

- In charge of the integration of Near Real Time data processing system within the NOAA operational environment.
- Responsible for technical and operational qualification and testing of these elements.
- In charge of interface between ESPC system and the rest of the NOAA OSTM ground segment.
- Serves as the primary interface with the user community for Near Real time data and products.

3.5.4.7 ARCHIVE AND ACCESS ENGINEER

A representative from OSD will serve as the OSTM/Jason-2 Archive and Access Engineer. The Archive and Access Engineer will be responsible for:

- Development of an agreement on the interface between the Comprehensive Large Array-data Stewardship System (CLASS) and the ESPC for ingest of the OSTM/Jason-2 data products
- Identification of the changes to be made to the CLASS for archival of the OSTM/Jason-2 data products and for distribution of such archived products to the designated user community

Development and integration and test (I&T) of the identified changes into the CLASS to ensure that CLASS is capable of supporting the OSTM/Jason-2 operationally

4. MISSION ASSURANCE

4.1 MISSION ASSURANCE MANAGEMENT

4.1.1 SPECIFICATIONS

The top level Mission Assurance requirements applicable to the OSTM/Jason-2 mission shall be described in a dedicated document : "OSTM/JASON-2 4 PARTNER MISSION ASSURANCE POLICY" (AD14)

All participating agencies within OSTM are committed to fulfill these management rules and apply rules and standard enabling to achieve this commitment.

It is the responsibility of each of the OSTM implementing agency to ensure that the development, testing or operation of any element of the OSTM system under its responsibility is done according to its own Mission Assurance practices and that these practices are compliant with the OSTM Mission Assurance policy.

This applies either to the elements directly developed by the agency or sub-contracted by the agency.

These mission assurance rules shall be described in a Mission Assurance Plan developed by each agency. This plan can be a set of standard requirements or procedures applicable within the Agency or tailored to a specific activity or contract in the frame of OSTM/Jason-2.

The mission assurance plan developed by each implementing agency shall be made available to the other partners for verification of consistency and coherency between the different plans.

In case of a major discrepancy, major being understood as having a potential impact on the compliance with the Mission Assurance Policy, this discrepancy shall be discussed at project manager level with the support of their Mission Assurance team in order to suppress it or at least to make it acceptable with respect to the Mission Assurance specification and the result of this shall be traced in the Mission Assurance Plan.

Any remaining discrepancy, which can not be solved at Project manager level, shall be brought up to the JSG for final decision.

4.1.2 ANOMALY MANAGEMENT

The anomaly management process between the 4 partners shall be described in the "OSTM/JASON-2 4 PARTNER MISSION ASSURANCE POLICY" document (AD14).

Here again, each agency shall apply its own anomaly management process and tools.

Nevertheless, exchange of anomaly list and description file shall be possible across the various partners.

Each partner shall make available to the others its anomaly list in order for the upper level (system) to check that anomaly having potential impact at system level are well identified and addressed at that level.

4.2 SAFETY

In addition to the above-described Mission Assurance process including Reliability, Availability, Maintainability, Security (RAMS) activities, a dedicated activity dealing with Safety is needed, which general process is described hereafter. The two main activity periods where safety requirements apply are the satellite Assembly, Integration and Test (AIT) sequence, and the Launch Campaign.

During satellite AIT sequence, the requirements will be those in place at the satellite contractor premises. These requirements shall be provided in due time to instruments and Electrical/Mechanical Ground Support Equipment (EGSE/MGSE) contractors in order for them to include these requirements in their design process. These requirements are included in each "Instrument Interface Specification" (IIS) document.

For the Launch campaign, the NASA safety requirements shall be made available to all partners.

A tailoring process of these requirements shall then take place taking into account the precise characteristics of the Jason-2 satellite such as type and amount of propellant, pyro classification…..This tailoring process shall take place early enough in order to avoid late modification that would have dramatic impact on the overall cost and schedule. Moreover, any applicable heritage from prior PROTEUS missions (Jason-1, CALIPSO) which went through the same process shall be taken into account. The modification with respect to the applicable PROTEUS requirements shall be minimized and clearly identified.

These tailored requirements (AD11) will be applicable for the satellite including the instruments and associated MGSE/EGSE and shall cover the entire launch campaign sequence.

As for Jason-1, and answering to these requirements, a safety analysis (AD22) shall be prepared by CNES with the support of industry and with provided information by the other partners on the elements under their responsibility.

A first release of this safety analysis shall be made available to the safety authorities by the beginning of satellite Phase C with a clear indication of potential non-compliance with respect to tailored requirements.

As soon as a major non conformance is detected, the point shall be addressed at project level and with the safety authorities in order to solve it and the proposed solution brought up to the JSG.

In addition to this safety analysis, a safety plan describing the safety organization and role and obligation of each partner during the various phases of the Launch Campaign shall be issued.

NASA/JPL is the implementing agency for safety **for the NASA instrument**, Launch Vehicle and Launch site processing services.

4.3 RISK ASSESSMENT

Risk management is the process that identifies project elements/events, both technical and programmatic that could cause the mission to fail and not meet its objectives, should they occur. The process involves the analysis of these elements/events as to their likelihood, their impact, and their relative priority, and then develops and implements control plans for mitigation, containment, acceptance, or other action. Risk management assures that risks are tracked and that information about elements/events with high risk is communicated across all levels of the Project.

Detailed policy about risk management is described in OSTM/JASON-2 4 PARTNER MISSION ASSURANCE POLICY (AD14)

4.3.1 RISK MANAGEMENT POLICY

All major Project elements/events having both high probability of occurrence and high impact/severity (see AD14) to the success of the mission shall be identified, analyzed and documented.

The following shall be included in the documentation for each credible risk element/event regardless of probability :

Description of the element/event and the assessed Level of risk of occurrence

Description of the consequences

Mitigation plans, if any

Characterization of the risk as "acceptable" or "unacceptable"

4.3.2 RISK MANAGEMENT PROCESS

The Project shall develop and maintain a risk register which lists elements/ events with the greatest potential of impacting the mission in an adverse way should they occur. For those elements/events which are both credible and likely to occur and based on the recommendation of Project Systems Engineering, the Project management team will assess and determine what proactive actions should be implemented. Risk management is a process that continues iteratively throughout the project life cycle. Risk management status shall be reported at major project reviews as appropriate but also at any time during the project if circumstances dictate to do so. In this case, the JSG is the appropriate reporting assembly and will in this case be assisted by expert of the domain in question.

Any decision regarding the acceptability of a risk (in terms of impact gravity and/or probability of occurrence) shall not be the unique decision of the project engineering team and the project manager(s) but shall also be endorsed at JSG level following recommendation by review steering committee or dedicated panel of experts.

4.3.3 RISK MANAGEMENT IMPLEMENTATION

The techniques which can be utilized by the OSTM/Jason-2 Project to identify risks and to track the status of on-going risks are described in AD14. These techniques apply across the Project and at all Project levels and serve to ferret out the risks that need to be analyzed and evaluated in detail to a final disposition by the risk management process previously described.

5. SYSTEM AND OPERATIONS

5.1 SATELLITE AND PAYLOAD INSTRUMENTS

The satellite includes the satellite bus and the instruments constituting the payload.

The satellite bus itself is made up of a platform based on the PROTEUS definition, a payload instrument module and a launcher adapter.

The PROTEUS platform includes the support functions for on-orbit operations, including provision of electrical power, command and data handling, science data storage, attitude control, orbit station keeping, thermal control, and S-band up-link and downlink telemetry and telecommand. Additionally, the Platform provides the Payload with discrete and analog channels, which can be monitored on-orbit by the Platform or on the ground, as well as the following data to the Payload via the Mil-Std-1553B bus: Time and Satellite attitude data.

The payload instrument module supports the Jason-2 payload and provides the required functions (mechanical, thermal...) and interfaces (harness, data bus...).

The platform and the payload module are developed under CNES contracts with Alcatel. The platform will be a protoflight, the qualification of the generic PROTEUS platform being acquired through the PROTEUS program, including the Jason-1 and Calipso satellite development.

The integration and test of the payload instruments on the payload module is performed by Alcatel under CNES contract.

5.1.1 PAYLOAD CONFIGURATION

The core Jason-2 payload consists of the suite of the following science instruments:

- a two frequency altimeter named POSEIDON 3 and its associated antenna, provided by CNES and developed by Alcatel under CNES contract
- a three frequency radiometer and its antenna named Advanced Microwave Radiometer (AMR) provided by NASA
- a Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS) receiver package with a DORIS receiver and its associated antenna, provided by CNES and developed by THALES under CNES contract
- a laser retroreflector array (LRA) provided by NASA
- a high precision GPS space receiver (GPSP) and its antennas, provided by NASA.

DORIS package will also include optional added passenger instruments :

- two detectors of particles and radiations named CARMEN2 (Environment Characterization and Modelisation) and LPT (Light Particle Telescope) provided by CNES
- a Laser Link Time Transfer system(T2L2) provided by CNES

In addition to their own scientific objectives these optional instruments are expected to allow the improvement of the DORIS oscillator performance. Addition of the optional instruments will be decided according to their readiness without any impact on the OSTM mission.

For the passenger instruments the accommodation constraints are :

- No impact on Core mission accommodation (spacecraft architecture, command control, power)

- No risk on Satellite
- No operational constraints
- Experiments can be switched off at any time.
- Instruments shall not impact the development schedule

CNES will develop an implementation plan for the optional instruments which describes the conditions under which the experiments would be replaced by mock-ups to ensure a consistent and timely decision process to manage unexpected changes in the optional instrument development plans or any unforeseen risk/impacts to the core mission.

5.2 LAUNCHER

For Jason-2 the Launcher will be based on a Boeing Delta II rocket compatible with the Jason-2 satellite and OSTM mission requirements according to RD1.

The Payload Interface will be : 3715C PAF (same as Jason-1) to maintain 37” diameter clampband interface

The Launch site will be Vandenberg Air Force Base (VAFB) in California - USA.

The Launch Vehicle (LV) Authority to Proceed (ATP) is expected after the NASA Mission Confirmation Review (conducted 6 – 8 weeks after the Mission/System PDR). The exact LV configuration taking into account all technical constraints and variances will be baselined by the time of the ATP.

The LV implementation will follow the NASA standard development process and will be coordinated via telecon and meetings between JPL, Kennedy Space Center (KSC) and CNES. This process will be formalized with in a LV implementation plan.

5.3 GROUND SYSTEM ARCHITECTURE AND OPERATION CONCEPT

The four OSTM Partners will jointly establish and operate an OSTM ground segment including all elements and all facilities required to operate the Jason-2 satellite, acquire its telemetry, process, distribute, and archive data and Data Products, deliver near real time and off line services to operational and research users.

The ground system architecture with the description of all the main constituting elements, their functions, and interfaces as well as the way this system will be operated during the various phases of the mission are described in the document “OSTM/JASON-2 GROUND SYSTEM REQUIREMENTS, ARCHITECTURE AND OPERATIONS CONCEPTS” (AD4)

The description of the tasks to be implemented at Jason-2 Ground System level, mainly Technical Integration (IT), Ground Technical Qualification (GQT), Technical Qualification (QT) and Operational Qualification (QO) tasks is given in this document and in the document “OSTM/JASON-2 SYSTEM TESTS REQUIREMENTS” (AD7) which details the sequencing of the Ground tests in these phases.

The ground system consists of a control ground system and a mission ground system:

5.3.1 CONTROL GROUND SYSTEM

It includes :

a Satellite Control Center (J2CCC) located in Toulouse (France) provided by CNES

This center monitors the satellite during the complete mission life time. Satellite control and operations are executed from this center until the Handover Review in the operational phase. Following this milestone, operations plan preparation, navigation functions, platform configuration changes as well as performance and trends analysis are still this center's responsibility while flight operations including satellite activities scheduling, command plan preparation, command transmission and telemetry acquisition and routing are transferred to the NOAA Satellite Operations Control Center (SOCC).

a Satellite Operations Control Center (SOCC) located in Suitland near Washington D.C (USA) provided by NOAA

This center will be used from the launch till the Handover Review to manage the NOAA stations for routine telemetry dumps (TM and TC) and as a support for contingency operations including commanding if needed. From the Handover Review satellite control and flight operations are executed from this center for the remainder of the mission.

an Earth Terminal/Stations Network

The CNES control center and the NOAA operation control center rely (for command transmission and data acquisition) upon a ground terminal network of earth terminal/stations suitably located to allow the required orbit coverage compliant with the data latency requirement.

This Earth Terminal/Stations Network is composed of :

the NOAA Fairbanks Command and Data Acquisition (FCDA) Station located in Alaska (USA)

the NOAA Wallops Command and Data Acquisition (WCDA) Station located in Virginia (USA)

the EUMETSAT Usingen Earth Terminal (USG) located in Germany.

The Earth Terminal/Stations Network performs satellite telemetry capture, its recording and distribution to the control centers and to the mission centers. The Earth Terminal/Stations also perform the uplink commanding to the satellite.

5.3.2 MISSION GROUND SYSTEM

It includes :

a CNES mission system, with a mission center SSALTO multi-missions ground system (Segment Sol Multimission Altimétrie et Orbitographie) for CNES instrument programming and monitoring (POS3 altimeter and DORIS), for Precise Orbit Determination (POD) , for products generation and for data and products archiving and distribution for the mission, a Near Real Time (NRT) facility management (operations support and maintenance), a Doris system beacons network and associated maintenance service and Service Altimetrie et Localisation Precise (SALP) experts, for a long-term quality check

a EUMETSAT mission center with a near real time processing center, and a data and products archiving and distribution infrastructure for the mission.

a NOAA mission center with a near real time processing center and a data and products archiving and distribution infrastructure for the mission.

a NASA/JPL mission center for JPL instrument programming and monitoring and for command requests generation (AMR, GPSP).

Passengers mission centers for Passengers instruments programming and monitoring and for command requests generation (T2L2, LPT, CARMEN2).

5.3.3 OPERATIONS CONCEPT

The OSTM/Jason-2 operation concept is to be as close as possible to Jason-1 operations. The Jason-1 operational documentation will be used as a reference to build the Jason-2 operational documentation.

The new partners (EUMETSAT, NOAA) operations specificities will be taken into account as far as possible to build the different frames (LEOP, Nominal operations, …) of the OSTM/Jason-2 Operations.

After launch the 4 partner operation coordination will be made through weekly teleconferences named Operational Coordination Group (OCG). OCG will at least involve :

- CNES satellite operational mission manager, who chairs the meetings,
- CNES Responsible for Operations (ROPS), secretary of the OCGs
- NOAA Operations engineer
- NOAA Jason-2 project representative
- CNES operational teams on duty,
- CNES SALP mission manager
- CNES Jason-2 project representative
- EUMETSAT Jason-2 Operation/Product engineer
- EUMETSAT Jason-2 project representative
- JPL Instrument manager
- JPL Jason-2 project representative

The OCG will analyze the satellite and ground status and will prepare all the satellite and ground operations to be conducted in the weeks following the OCG.

5.4 DATA PRODUCTS

"Data Products" are those resulting from processing the Payload Instrument Data and any necessary supporting Housekeeping Data and/or ancillary data. These fall into two general categories:

a. Near Real Time (NRT) Products, available within a few hours of acquisition by the satellite; and

b. Offline (OFL) Products, available with a delay of several days or weeks after additional processing.

Data Products will be, at a minimum, consistent with TOPEX/Poseidon and Jason-1 data products.

5.4.1 OSS DATA PRODUCTS

The products which will be provided by the partners with an associated operational service to the users will be defined in the "Operations Services Specification (OSS)" - AD1.

Five different data products shall be produced and distributed to the users :

1. Operational Geophysical Data Record (OGDR)
2. Interim Geophysical Data Record (IGDR)
3. Sensor - Interim Geophysical Data Record (S-IGDR)
4. Geophysical Data Record (GDR)
5. Sensor - Geophysical Data Record (S-GDR)

The first one is a NRT product. The other four are OFL products.

The description is given in AD1.

5.4.2 NON-OSS DATA PRODUCTS

The Non-OSS products and associated services will be defined during the OSTM/Jason-2 project development. They will be described in a dedicated partner documentation.

These products could be :

- SSALTO/DUACS products
- possible coastal zone products
- possible in land water products
- etc…

5.5 DATA PROCESSING , ARCHIVING AND DISTRIBUTION

5.5.1 DATA EXCHANGE

During all OSTM Phases, EUMETSAT is responsible for making available all Telemetry acquired at the European Earth terminal to the other Partners (see AD4).

During all OSTM Phases, NOAA is responsible for making available all Telemetry acquired from the NOAA CDA Stations to the other Partners (see AD4)

5.5.2 OSS DATA PRODUCTS PROCESSING AND DISTRIBUTION

The processing and distribution requirements for OSS products are given in AD1.

According to the division of responsibility, near real time product generation and distribution is a EUMETSAT and NOAA responsibility while production of the offline product is performed only by CNES. Off line products distribution is a CNES and NOAA responsibility.

CNES and NOAA will permanently archive and provide access to all OSTM/Jason-2 telemetry, products and ancillary data (e.g. commands). This is true whether the information originates at NOAA, EUMETSAT or CNES.

NOAA will generate the NRT products from Payload Telemetry (PLTM) originating at NOAA ground sites. The NRT products will be validated, and accountability and quality reports will be generated. NRT products will be available to users via two methods: retrieval by the customer or automatic delivery to a customer site. Higher-level products will not be available for automatic delivery but will have to be requested by the user for either electronic retrieval or dissemination by other media such as DVD.

EUMETSAT will generate the NRT products from PLTM originating at EUMETSAT ground sites. The NRT products will be validated, and accountability and quality reports will be generated. EUMETSAT will permanently archive and provide access to all NRT products (OGDR). NRT products will be available to users via EUMETSAT dedicated broadcast system

CNES will generate the OFL products from all received PLTM. The OFL products will be validated, and accountability and quality reports will be generated according to AD1.

CNES and NOAA will make OFL products available to users via their own distribution system through one of the two methods: retrieval by the customer or automatic delivery to a customer site.

CNES is responsible for definition, specifications, software development and validation for POSEIDON-3 altimeter algorithms.

NASA is responsible for the definition of AMR algorithms.

CNES is responsible for specifications, software development and validation for radiometer algorithms.

CNES is responsible for the development of the OGDR production software.

EUMETSAT is responsible for the delivery of the software (and its specification) translating native format OGDR into Binary Universal Form for the Representation (BUFR) format OGDR

CNES is responsible for the specifications and development of the offline (IGDR, S-IGDR, GDR, S-GDR) production software.

CNES is responsible for the definition, specification, software development and validation for Precise Orbit Determination except GPS pre-processing algorithms definition.

NASA is responsible for the definition of GPS pre-processing algorithms.

It should be noticed that all algorithm definition documents will be available to 4 partner Science Team and to the Principal Investigators (PI) in the frame of OSTST meetings or dedicated algorithms review meetings.

5.5.3 NON-OSS DATA PRODUCTS PROCESSING AND DISTRIBUTION

Non-OSS Data Products will be processed according to each partner product definition.

The partner which generates the Non-OSS data products is responsible for the products archiving and distribution.

Non-OSS Data Products contents could be presented to the OSTST.

5.5.4 USER SERVICES AND OUTREACH ACTIVITIES

Each Party being in contact with users shall ensure the proper implementation of a user service ensuring proper recording and follow up and closure of user request or inquiries. A Procedure for exchanging information between User services will be implemented to ensure:

a) Questions related to, or, of the responsibility of, another User Service / Partner will be quickly forwarded to the relevant User Service (example: all questions related to EUMETCast will be sent to EUM)

b) User logging will enable identification of users. CNES/NOAA /EUM will exchange their users list.

c) Messages sent to "all users" will be coordinated between user services to avoid risk of contradiction.

d) Distribution of documentation to users will be coordinated between the 4-party

Each Party will also develop outreach activities ensuring release of public information regarding their activities and promotion of mission results and achievement. Outreach activities addressing system activities will need to be coordinated among the partners before release to the public. This refers to outreach tasks performed at the occasion of important programme milestones (Agreement signature, preparation of launch...) where all partners are involved or when addressing global mission results.

Points of contact shall be identified by each Partners in these two areas

5.6 INTEGRATION AND TESTING

5.6.1 SATELLITE

ALCATEL is responsible with the support of CNES and NASA for the definition and execution of all satellite Assembly, Integration and Test (AIT) activities to be performed. Instruments suppliers (CNES and JPL) will provide the required instruments AIT requirements in a document called “Jason-2 payload integration and test requirements" and under CNES responsibility. The input given in this document will be used by the satellite contractor to build the Satellite AIT Plan and associated detailed procedures.

The instrument suppliers will operate the instruments GSE for instruments test sequence preparation, execution and validation of the test sequence.

Detailed organization and responsibilities during the Payload module and Satellite Assembly, Integration and Test phases are described in the « Jason-2 Integration and Test Organization (AD8) document »

5.6.2 GROUND SYSTEM

Each partner will generate an Integration and Test Plan. This plan will address how the components they are responsible for will be integrated. Once the Integration and Test activity begins, each partner will disseminate the status of their integration and test to the other partners. This will help all partners in planning for the 2 by 2 integration of the J2GS elements. These activities are made in the IT phase.

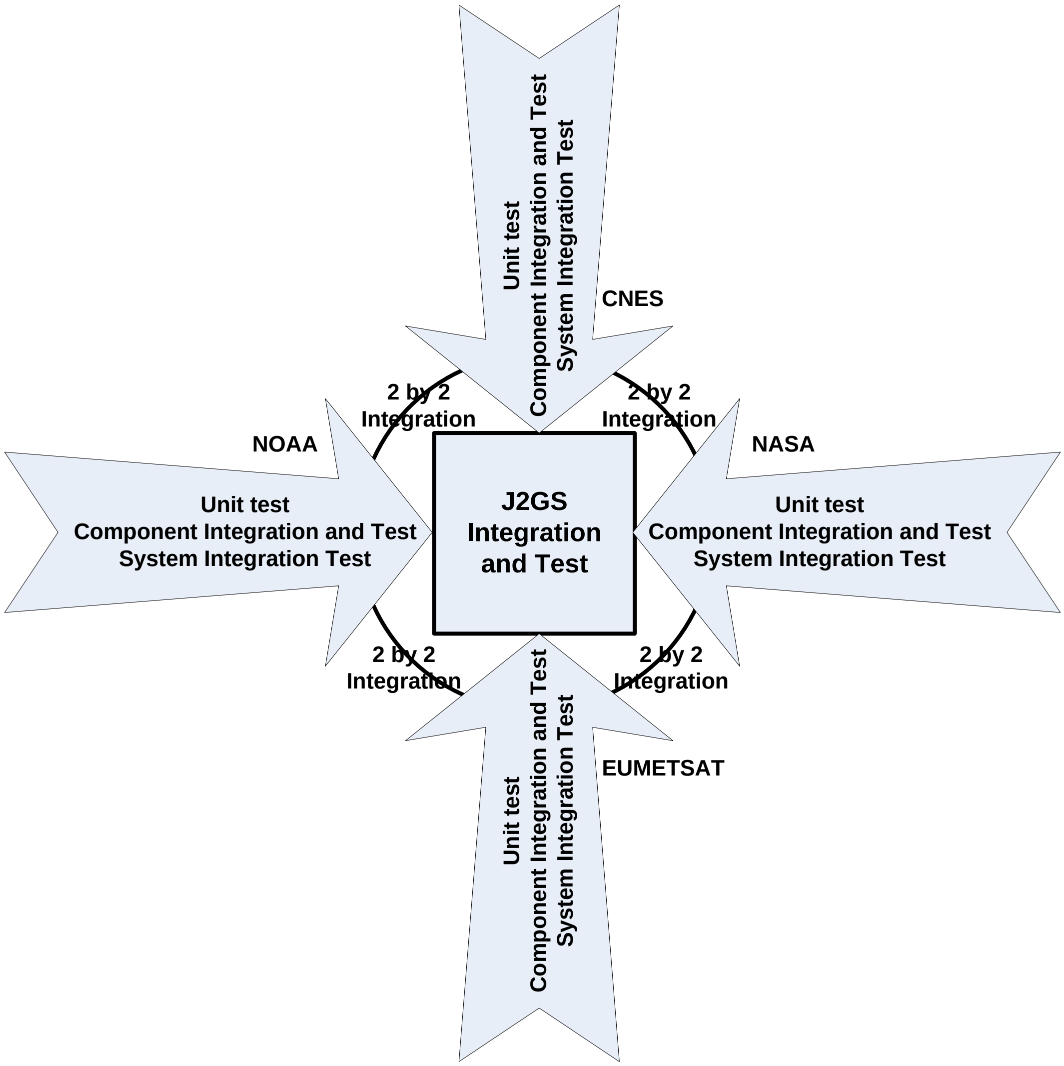
To define and carry out the compatibility and integration tests (aim of the Ground Technical Qualification - GQT phase) a OSTM/JASON-2 GROUND SYSTEM INTERFACES document (AD21) has to be issued. This document will describe all the interfaces between the main elements of the ground system. Once the ground interfaces document (AD21) agreed to each partner will follow these interfaces in the design and implementation of their components. Changes to the ground interfaces document (AD21) will be coordinated with the other affected partners through a Change Request process described in the Configuration Management rules (see AD15).

For the 2 by 2 integration tests a compatibility integration test plans will be established after agreement between two of the partners by following the ground interfaces document (AD21). Each partner will establish its own test procedures.

Compatibility integration tests of the whole OSTM/Jason-2 ground system will be conducted by CNES.

At the end of the GQT Phase all the OSTM/Jason-2 ground system will be validated in term of content structure, connections, transfer protocol and exchanges directories.

The following diagram identifies the level of activities at each partner level and then the integration at the entire system level.



Ground Segment Integration and Testing

As soon as the compatibility tests are performed and the satellite simulator and the satellite database are available the OSTM/Jason-2 ground system functional tests can begin.

The Technical Qualification (QT) Phase is dedicated to functional tests. All the required functions of the OSTM/Jason-2 ground system described in OSTM/JASON-2 GROUND SYSTEM REQUIREMENTS, ARCHITECTURE AND OPERATIONS CONCEPTS (AD4) will be tested and validated till the OSTM/Jason-2 ground system is technically qualified.

The last qualification phase is the Operational Qualification (QO) Phase. In this phase, operational tests will be carried out from the operational procedures. Operations personnel will be trained in how to operate the computers and software of the OSTM/Jason-2 ground system. An Operational Readiness review (ORR) will take place for the beginning of this phase after some major operational tests (like global dress rehearsal for LEOP) and will provide outputs to help to conduct the end of the Operational Qualification. This phase ends with the launch.

The management of all these tests (for instance "Test Readiness Review" meetings before tests and "Post Test Review" meetings after tests) is described in the OSTM/JASON-2 4 PARTNER MISSION ASSURANCE POLICY (AD14).

5.7 CALIBRATION AND VALIDATION

A 4 partner « Calibration/Validation Plan » (AD 9) will be issued with objectives of:

a) definition and assessment of performance goals for all system components, and

b) definition and plans for in flight performance measurement and analysis of accuracy, precision, and drift.

The Calibration/Validation (CALVAL) plan will serve several objectives including:

- The assessment and updating of the system performances in order to verify the pre-launch error budget and to establish the post-launch error budget

- The calibration and validation of all critical geophysical outputs of the system with an accuracy consistent with the error budget including range, corrections, wave height, wind (and possibly sigma naught), and orbit

- The validation/improvement of the algorithms (level 1 and 2) used to produce the geophysical data products

- The determination and control of system drifts (within 1mm/year as a goal)

- The connection between Jason-1 and Jason-2 time series.

4 partner teams, leading by CNES and NASA project offices respectively, will jointly work on these CALVAL tasks in relation with instrument teams, orbit and data production teams, designated experts and the OSTST.

As part of these CAL/VAL activities there are:

- On-site campaigns with sites (Harvest, Corsica, …) equipped with all needed in-situ instruments: tide gages, radiometer, GPS receivers, laser, DORIS data, …

- Global verification, relying on statistical routine analysis, mainly based on daily automated analysis of OGDR and Interim data products, and automated cycle by cycle processing, including histograms, cross-over and along track analysis, mapping and long term survey of main sensor and geophysical parameters.

- Other specific CALVAL activities, proposed by experts or PIs are expected as global external calibration and drift monitoring using tide gage network collocated with DORIS and/or GPS permanent stations. Multi-satellite calibration/validation are also among the other verification procedures which should provide pertinent outputs.

- The Precise Orbit Determination expertise consists in checking the orbit accuracy, characterizing the orbit errors and determining the needed adjustments to reduce it. It will cover the validation of the medium precision satellite ephemeris (MOE) delivered within 1.5-2 days and the precision satellite ephemeris (POE) delivered within 3-4 weeks. The CNES orbit production center will mainly work on statistics, including DORIS, laser, GPS residual analysis (global, station by station statistics, Guier processing) end-to-end orbit and short arc overlaps, cross-over residuals. As for Jason-1, external operational verification is expected in order to check the long term orbit stability, to perform orbit error analysis and to report to the OSTST. This will be based on expertise groups which are already supporting Jason-1 orbit validation activities and which are selected within the OSTST. This has lead to create a POD working team which pre-launch activities will be devoted to the verification of the POD system and GPS processing capabilities, evaluation of improved models and convergence on standards. Post-launch activities will concentrate on comparison of data and orbits during the initial verification phase, continuation of improved models evaluation and final Jason-2 model choice.

The CAL/VAL activities will be maintained through the entire Jason-2 mission in order to ensure a long term monitoring of the system. However, an intense verification period is scheduled during the first 6 months after launch. This verification phase will be used to carefully check the functioning of the system and to assess its performances. During this period, only OGDR, S-IGDR and IGDR will be made available to experts and Pis. A verification workshop at the end of this period will allow to report on the results and to decide about the validity of algorithms used for further GDR processing and about OGDR distribution to users. A second workshop about 10 to 11 months after launch will take place to report on the results for Offline products, to decide about the re-processing tasks and about Offline products distribution to users. The Jason-1/Jason-2 tandem mission during the intense verification phase (the two satellites will be flying on the same orbit only separated by less than 10 minutes) will be particularly useful to cross-calibrate both systems.

The CALVAL plan requires a close interaction among system engineers, data and POD production centers, experts and OSTST. This needs a quick and efficient exchange of data and information between all these key persons. Based on T/P and Jason-1 experiences, regular reports will be provided through e-mails, CALVAL bulletins and at the OSTST meetings.

6. DOCUMENTATION MANAGEMENT

6.1 DOCUMENTATION TREE AND APPROVAL PROCESS

The documentation tree is described in OSTM/JASON-2 4 PARTNER DOCUMENTATION TREE (AD18)

The two documents which give the frame of OSTM/Jason-2 needs and agreements are :

- 4 partner MOU
- OSTM/JASON-2 SCIENCE AND OPERATIONAL REQUIREMENTS

Then the OSTM/Jason-2 documentation is split into 4 main categories:

- Level 1 documents
- System documents
- OSTM/Jason-2 major element documents
- Partner documents

6.1.1 LEVEL 1 DOCUMENTS

Level1 documents are documents which commit the 4 partners in term of :

- organization and tasks
- operational services for products generation, archiving and distribution

OSTM/JASON-2 PROJECT PLAN

Provided by CNES

Signed by : CNES, EUMETSAT, JPL, NOAA

Approved at : JSG level

JASON-2 OPERATIONS SERVICES SPECIFICATION

Provided by CNES

Signed by : CNES, EUMETSAT, JPL, NOAA

Approved at : JSG level

6.1.2 SYSTEM DOCUMENTS

System documents are related to mission documents useful for all the 4 partners in terms of requirements, interfaces, product assurance, configuration management, schedule, mission analysis, tests and operations. These documents will coordinate the 4 partner development and mission phases.

The following system documents are:

Provided by CNES

Signed by : CNES, EUMETSAT, JPL, NOAA

Approved at : Project level

OSTM/JASON-2 SYSTEM REQUIREMENTS

OSTM/ JASON-2 SYSTEM MASTER SCHEDULE

OSTM/JASON-2 4 PARTNER MISSION ASSURANCE POLICY

OSTM/JASON-2 4 PARTNER CONFIGURATION MANAGEMENT POLICY

OSTM/JASON-2 4 PARTNER DOCUMENTATION TREE

OSTM/JASON-2 ENGLISH/FRENCH GLOSSARY OF TERMS AND ACRONYMS

OSTM/JASON-2 SYSTEM TESTS REQUIREMENTS

OSTM/JASON-2 CAL/VAL PLAN

OSTM/JASON-2 MISSION ANALYSIS

JASON-2 SATELLITE TO GROUND INTERFACE SPECIFICATION

OSTM/JASON-2 SYSTEM DATA BASE

RISK REGISTER including :

- CNES RISK REGISTER
- EUMETSAT RISK REGISTER
- NOAA RISK REGISTER
- NASA/JPL RISK REGISTER

OSTM/JASON-2 SPACE DEBRIS MITIGATION PLAN

6.1.3 MAJOR ELEMENT DOCUMENTS

OSTM/Jason-2 major element documents are documents dedicated to one major element of the OSTM/Jason-2 system : Launcher, Satellite and Ground System.

Launcher and Safety:

JASON-2 SPACECRAFT QUESTIONNAIRE

JASON-2 MISSION SPECIFICATION (BOEING MISSION SPECIFICATION)

JASON-2 SAFETY PROGRAM PLAN

JASON-2 MISSILE SYSTEM PRELAUNCH SAFETY PACKAGE

LAUNCH SITE SUPPORT REQUIREMENTS AND LIST

LAUNCH SITE OPERATION PLAN

Satellite :

JASON-2 SATELLITE REQUIREMENTS

JASON-2 SATELLITE ENVIRONMENTAL REQUIREMENTS

SATELLITE / INSTRUMENTS INTERFACES SPECIFICATION

JASON-2 PAYLOAD INTEGRATION AND TEST REQUIREMENTS

SATELLITE ASSEMBLY, INTEGRATION AND TEST (AIT) PLAN

JASON-2 SATELLITE INTEGRATION AND TEST ORGANIZATION

JASON-2 PAYLOAD INSTRUMENTS DELIVERABLES ITEM LIST

Ground System :

OSTM/JASON-2 GROUND SYSTEM REQUIREMENTS, ARCHITECTURE AND OPERATIONS CONCEPTS

OSTM/JASON-2 GROUND SYSTEM INTERFACES

Signature of these documents will be made at project manager level for the concerned partners.

6.1.4 PARTNER DOCUMENTS

Partner documents are related to the internal partner documents. These documents are signed internally by the concerned partner. They can be made available to the other partners as far as interfaces are concerned.

6.2 DOCUMENT DESCRIPTION

The document description is given in OSTM/JASON-2 4 PARTNER DOCUMENTATION TREE (AD18).

6.3 WEB SITE REPOSITORIES AND ACCESS

The System documents (and other documents agreed by the 4 partners) will be available on a OSTM/Jason-2 CNES website as described in OSTM/JASON-2 4 PARTNER CONFIGURATION MANAGEMENT POLICY (AD15).

The access to the documents will be an authorized access managed by login and password.

Description of the document access through the website is given in OSTM/JASON-2 4 PARTNER CONFIGURATION MANAGEMENT POLICY (AD15).

7. CONFIGURATION MANAGEMENT

7.1 RULES AND OBJECTIVES

Configuration management ensures the management of the technical description of a system and its components and of the changes which successively affect this description.

When the Technical Specifications are approved, the actors in the project must implement configuration management for the items of the product under their design responsibility.

The aim of Configuration management is :

- to know, at all times, the technical description of the system and its components by means of approved documentation,
- to control the changes to the technical description of the system,
- to facilitate coherence between the components of the system (control of external interfaces), and the products comprising these components (control of internal interfaces),
- to check that the documentation is and remains an exact reflection of the products that it describes,
- to identify the applicable configuration and the applied configuration in order to deal with deviations and/or waivers detected during the production, delivery or use of the product,
- to enable all users to know the possibilities and utilization limits of each example of the product and, in case of anomalies, the examples affected.

The objective of the Configuration Management (CM) is to be able to easily identify and recreate the operational versions of software. The CM should be able to identify the configuration of the operational hardware. Through the CM processes and tools all the modifications to hardware and software should be recorded and tracked. The CM processes and tools should be able to create any known version of the software and be able to identify the hardware configuration.

For the 4 partners the configuration management policy is described in OSTM/JASON-2 4 PARTNER CONFIGURATION MANAGEMENT POLICY (AD15)

7.2 CONFIGURATION MANAGEMENT TASKS

The four main configuration management tasks are :

The Configuration Identification task: applies to the technical documentation which identifies and describes the approved configuration of a product during the project phases.

The Configuration Control task: concerns the systematic evaluation, the estimation, the approval and the application of change requests relevant to a product the configuration baseline of which has been covered by an official approval.

The Configuration accounting and monitoring task: concerns the recording and the writing of the description of all deviations on a product, between the configuration accepted at a given time and the applied configuration of the product.

The Configuration verification task: includes all control points systematically performed during the phases of the project or in an isolated manner.

7.3 CONFIGURATION MANAGEMENT ORGANIZATION

For the 4 partners the configuration management organization is described in OSTM/JASON-2 4 PARTNER CONFIGURATION MANAGEMENT POLICY (AD15)

The document covers the Configuration management at System level.

Each partner covers its own Configuration management for partner tasks.

CNES will assure the configuration management tasks for System level.

7.4 CONFIGURATION MECHANISMS

For the 4 partners the mechanisms to follow about the configuration management are described in OSTM/JASON-2 4 PARTNER CONFIGURATION MANAGEMENT POLICY (AD15)

At system level Change Requests, Change Requests instruction and Configuration Management boards will be managed as described in AD15.

8. PROJECT REVIEWS

8.1 REVIEW PROCESS DESCRIPTION

The purpose of Project reviews is to assess the completion of Project activities at the end of the phases and all participating agencies within OSTM are committed to conduct review for the elements under their responsibility and support higher level or interfaces reviews.

For each review, the convening authorities shall designate a review board, independent from the project team. The composition of this review board shall be optimized, so as to keep a continuity of the people all along the development of the project but also to adapt it to the dedicated project phase or project element under review. As the OSTM/Jason-2 is a 4 partner project the number of people provided by each partner should not be greater than 3 (more people has to be considered as an exception). As mentioned in the JSG paragraph the convening authorities will also assign steering committees for the system reviews

For system reviews, the review board will be composed of representatives from all agencies. For lower level reviews, the review board is mainly composed of representatives from the agency in charge of the element submitted to review, but participation of representatives from other(s) agencies may be foreseen particularly in the case of tight interfaces.

At the end of each review the designated review board shall gather its findings and recommendations in a report that will be submitted to the steering committee for final decision and identification of precise project actions to be fulfilled with clear assignee(s) and due dates.

The review objectives are to:

(1) Provide the review board with concise information and data sufficient for them to determine if the activity was acceptably accomplished.

(2) Provide information and data sufficient for the review board to recommend adequate decision to the steering committee.

(3) Provide assurance that any activity or decision has satisfied Project requirements and constraints relative to schedule, performance and risk.

Global Statement about the Review process:

Due to the multi agency feature of the programme, there are some deviations from standard way (ECSS, US Handbook, ...) of conducting reviews as presented below.

The standard review process is the following one but it can be adapted to any particular feature of the review. In such a case, this shall be clearly stated in the organization note.

Step 0: Preparation of organization note and review board members designation

Step 1: Presentation of the activity or element and associated documentation under review by the project team to the review board.

Step 2: Release of Review Item Discrepancies (RID's) by the review board to the project

Step 3: Answer to the RID's by the project

Step 4: After analysis of the project answers by the review board and classification of these as acceptable (with or without actions) or not, discussion session between project and review board to try to solve the remaining open points.

Step 5: Preparation of the review board report

Step 6: Steering Committee meeting

A "close out" meeting or telecon will be made to check the proper closure of actions issued from a review

There are three levels of reviews:

Level 1 are system reviews

Level 2 are major element reviews

Level 3 are internal partner reviews or key points

8.2 SYSTEM REVIEWS

System reviews are level 1 reviews.

System reviews are:

1. **System Preliminary Design Review (System PDR)** . The objectives of the System PDR are:
   - to review the compatibility between MOU, Level 1 documents and system documents,
   - to review the system definition consistency with required performances and mission objectives,
   - to validate the system architecture,
   - to assess the System budgets, the preliminary operational concepts, the preliminary items of the System Tests Requirements,
   - to assess if the quality rules are coherent between the partners,
   - to assess the critical points about the development,
   - to analyze the consistency of the system schedule with satellite and ground system elements schedules,
   - to identify and rank project risks.

   The System PDR takes place at the end of the System Phase B.

2. **Ground System Interface Review (SIR**) . Although it is restricted to the ground system interfaces and development status, the SIR has been included in the System Reviews because of the strong involvement of all the 4 partners in the ground system. The main objectives of the SIR are:
   - to review the ground system interfaces detailed definition,
   - to review the status of development of all the ground entities,
   - to verify the proper preparation of the Mission Operations in terms of documentation, tools and resources.

   The SIR takes place at the end of the System Phase C and before the Technical Ground Qualification (GQT) phase.

3. **Operational Readiness Review (ORR) .** The objective of the ORR is to demonstrate the Ground System readiness to operate for all mission phases : LEOP, assessment, routine. This includes :
- to demonstrate that the OSTM/Jason2 Ground System can safely operate the satellite and adequately react in case of contingency
- to demonstrate that the OSTM/Jason2 Ground System can elaborate and distribute the science products according to the system requirements
- to demonstrate the OSTM/Jason2 Ground System readiness for the System qualification during "In Flight Acceptance" phase
- to show the organization of Operation teams (people, hardware, etc, ..) at CNES,EUMETSAT, NOAA and JPL to ensure the OSTM mission
- for each OSTM/Jason2 Ground System element to give the status of the :
    - interfaces qualification
    - functional qualification
    - operational qualification
- to ensure that the status of the documentation is adequate for operations
- to ensure that the configuration management is operational (Anomalies, Change Requests, ...) for the mission
- to ensure that appropriate plans are in place for maintenance of on board software and satellite simulators

The ORR takes place during the QO phase, and about 2 to 3 months before launch, in order to give some time to implement before launch the actions and corrections as required by the Review Board.

4. **Satellite Operations Handover Review.** The objectives of the Satellite Operations Handover Review are:
- to verify that the NOAA & CNES OSTM/Jason-2 mission operations elements have met the following criteria for the Project to transfer mission control responsibility for the Jason-2 satellite from CNES to NOAA
Criteria are :
    - Satellite must be in Routine phase: in the operational orbit, in Nominal AOCS and CC mode.
    - CNES and NOAA must have agreed on all flight control procedures to be used by NOAA in the operation of the satellite.
    - CNES must have provided approved versions of all required operational documentation to NOAA: satellite users manual, satellite interface documents, ground and operations interface documents, sequence plans, flight control procedures.
    - NOAA must have demonstrated the ability to command the satellite and receive telemetry data after launch using both the NOAA stations and EUMETSAT Earth Terminal
    - NOAA must have demonstrated the ability to perform normal mode operations including sequence generation, satellite commanding, TM product generation, anomaly responses.
    - NOAA and CNES must have demonstrated the ability to generate and transfer all required J2GS products to each other.
    - NOAA and CNES must have exercised all operational interfaces.

The Satellite Operations Handover Review takes place two months after the start of the operational phase.

5. **Near Real Time Product dissemination Workshop (*) .** The objectives of this workshop are to assess the validation of the Near Real Time (NRT) products and to authorize the delivery of these products to the users .
It takes place 5 months after the beginning of the Verification Phase.

6. **Off Line Product dissemination Workshop (*) .** The objectives of this workshop are to assess the validation of the Offline (OFL) products and authorize their release to the users.
It takes place at the end of the Verification Phase.

7. **REVEX (yearly operation review) .** The objectives of the REVEX are:
- to evaluate the suitability of the board and the ground means to satisfy the mission objectives in routine phase,
- to establish recommendations about the change requests to implement in the different components in

order to improve the system efficiency or/and the satellite lifetime.

The REVEX reviews take place once per year, beginning one year after the Satellite Operations Handover Review.

(***** **-** Workshops are reviews meetings generally gathered with OSTST meetings)

"System reviews" review board:

CNES is the convening authority for System Reviews and as such is coordinating the review process as described above. Before Satellite Operations Handover NASA and CNES will co-chair the Review Board. After Satellite Operations Handover, EUMETSAT and NOAA will co-chair the Review Board.

The system review board shall nominally be composed of representatives of the four agencies working on OSTM, the precise composition depending upon the review.

The steering committee of the system review is the JSG where the review board chairman is invited to present the review group report.

Taking into account the results of the relevant reviews, the Partners will jointly:

a. Make a final determination of the system readiness for operations (JSG as Steering Committee of the Operational Readiness Review - ORR) ;

b. Make a final determination on the readiness of the satellite for integration with the launch vehicle (JSG following the Satellite Readiness Review - SRR – see section 8.3) ; and

c. Make a final determination of the overall readiness of the system for launch (JSG following the Flight Readiness Review - FRR – see section 8.3).

8.3 MAJOR ELEMENT REVIEWS

Major element reviews are level 2 reviews.

A major element of the OSTM/Jason-2 system is :

- Launcher
- Satellite
- Ground System

as defined in the OSTM/JASON-2 4 PARTNER DOCUMENTATION TREE (AD18).

For each major element, the agency in charge of the development, testing and /or operation of this element is in charge of the coordination, scheduling, and organization of the element reviews.

Basically, the process applied to those reviews is the same as for the system reviews, but may be simplified according to the level/criticality of the element or modified to better cope with in house or contractor standard.

Each agency is committed to invite the other agencies to participate (in accordance with any applicable government laws relating to foreign nationals participation) to its element's reviews but no board membership in the review board is offered. The review board members designation as well as the steering committee is the responsibility of the provider of the element.

Nevertheless, for each element review, a synthesis of the results of the review shall be sent to all project managers, to the members of the system review boards and to the JSG members for their information.

In the specific case of interface reviews between two or more elements of the system being developed by more than one agency (e.g. satellite/launcher interfaces), the two agencies will organize the review and propose membership to the review board.

For Satellite major element reviews are :

Satellite PDR (at the end of satellite phase B)

Satellite CDR(at the end of satellite phase C)

Satellite Qualification Review (after completion of environmental test and performance test sequence)

Satellite Pre ship Review (before the satellite shipment to launch facilities)

Satellite Readiness Review (after satellite checking and preparation activities on launch site before mating on launch vehicle)

End of Assessment phase Meeting

For Ground System major element reviews are :

Global Test Readiness Meetings (TRR) (before each main test and qualification phase : QT phase and QO phase)

For Launcher major element reviews are :

Launch Site Readiness Review (LSRR) (approximately Launch-14 days)

Flight Readiness Review (FRR) (Launch-3/4 days)

Launch Readiness Review (LRR) (Launch-1 day)

8.4 INTERNAL PARTNER REVIEWS OR KEY POINTS

Internal Partner Reviews are reviews organized internally by each partner about one of the element that it has to provide. Each partner will follow its internal rules for the review. The review board members designation as well as the steering committee is the responsibility of the provider of the element.

An Internal Partner Key Point is a meeting dedicated to one element without the review formalism.

Each partner has to inform the other partners about the occurrence of Internal Partner Review or Internal Partner Key Point. Each partner can invite other partners to attend the Review or the Key Point.

Nevertheless, at least, a synthesis of the results of the review or the key point shall be presented or sent to all project managers.

Example of internal partner review :

Instrument PDR

Instrument CDR

…

9. PROJECT SCHEDULE

9.1 SCHEDULE ELABORATION AND MANAGEMENT

9.1.1 SYSTEM SCHEDULE:

The bookkeeper of the system schedule will be the CNES system responsible. The system schedule will be composed of pieces of elements (flight/ground/system) schedule. For each of these element schedules, a single responsible will be designated and in charge of providing the detailed sub-levels schedule supporting the element schedule. It is the responsibility of the CNES system responsible to ensure coherency/consistency of the various inputs when building the system schedule. The system schedule is updated for the reviews or when modifications of the element schedule impacts system milestones. Any modification at system level which potentially impact the launch date shall be brought to the JSG.

9.1.2 ELEMENT SCHEDULES:

These are the element schedules aiming at building the system schedule. Their responsibility remains within the agency in charge of developing/integrating or testing the element. As long as modifications of any of the element schedule do not impact the system schedule, these modifications remain under the element responsibility level. On the other hand, if it appears that a modification may affect the system level schedule, this has to be brought to the system responsible in order for him to assess the impact at system level. Element schedules are updated for element reviews and on a continuous basis to reflect changes.

9.1.3 TOOLS:

The tool to be used for transferring/exchanging the schedule between the various levels is MS Project (issue 2000 or higher)

9.1.4 SCHEDULE RESPONSIBILITIES:

ELEMENT	RESPONSIBLE		ELEMENT	RESPONSIBLE
System	CNES		Ground System	CNES
Satellite	CNES		Upgrade CCC	CNES
Altimeter	CNES		Upgrade SOCC	NOAA
DORIS	CNES		Upgrade CDA	NOAA
AMR	JPL		Upgrade Archive System	NOAA
GPSP	JPL		EUM ET	CNES
LRA	JPL		EUM ET infra	EUMETSAT
T2L2	CNES		EUM ET integration	EUMETSAT
CARMEN2	CNES		Upgrade SSALTO	CNES
LPT	CNES		NRT processing	CNES
Payload AIT	CNES		NRT integration at NOAA	NOAA
Satellite AIT	CNES		NRT integration at EUM	EUMETSAT
Launch Campaign	CNES+NASA		GQT	Each agency for the element under its responsibility
SDB	CNES		QT	CNES
			QO	CNES
			In flight assessment	CNES

Schedules will be sent to CNES on a monthly basis and at any time if needed.

A System master schedule will be available every two months nominally and more often if needed by the 4 project managers

10. REPORTING AND MANAGEMENT PROCESS

10.1 REPORTING

Each agency will use its own internal reporting procedure as described in their own management plan.

At system level, a periodic reporting shall be made to the upper management, which in this case will be the JSG.

This reporting will be made every 6 month, which will mean, assuming one JSG meeting per year, that the members of the JSG will receive one system report in between the yearly meeting.

The CNES will be in charge of the coordination of the preparation and release of this document with contributions coming from the partners for the elements under their responsibility.

The system report shall at minimum include:

- A short summary of the main progress/milestones achieved in the program development.
- Details on any open issue and their potential impact on performance/schedule/cost
- An update of the each partner project risk register
- An updated system schedule (if modified since the last release of the report)
- Any major update on project organization or key personnel
- A short summary of outreach activities

10.2 ACTION ITEM MANAGEMENT

Action item lists will be managed and updated between 2 partners through dedicated partner telecons (see the Project Teams Interactions paragraph).

Four partner action item list will be managed by CNES and updated through the 4 partner interactions described in the Project Teams Interactions paragraph.

There are no constraints about the tools used for managing action item list.

10.3 PROJECT TEAMS INTERACTIONS

In order to facilitate the communication among the partners, all means of interaction shall be used.

This includes but is not limited to:

- In line Project documentation and tools
- Web site access for project system lists (anomalies, change request…)
- Web site access for review documents and process (RID’s, answer, Recommendations..)
- Use of bilateral and 4 partners telecon and videocon as needed
- Periodic face to face meeting or when a dedicated subject so requires

Four partner progress meetings could also be planned on a yearly basis nominally and more often if needed

Exchange of personnel can also be planned. This efficient way shall be used among the partners particularly with the objective to prepare and facilitate the process of integration of an element from one partner to another one (e.g. delivery of instruments, preparation of AIT, preparation of operation or hand-over).

10.3.1 SATELLITE AND INSTRUMENTS LEVEL

Telecons will take place every week between JPL and CNES until JPL instrument delivery.

An action item list will be managed between the CNES and JPL payload managers.

Periodic face to face meeting will be organized at least on a biyearly basis.

10.3.2 GROUND SYSTEM LEVEL

Telecons will take place every two weeks between NOAA, EUMETSAT and CNES (JPL can also attend these telecons).

An action item list will be managed between the CNES, NOAA and EUMETSAT ground managers..

Periodic face to face meeting will be organized at least on a biyearly basis.

10.3.3 4 PARTNER MANAGEMENT LEVEL

At 4 partner project manager level telecons will take place every two weeks between NOAA, EUMETSAT, JPL and CNES to address at least the following points :

- Main progress/milestones achieved in the partner development
- Partner risk register update
- Partner schedule evolutions
- Details on any open issue and its potential impact on the system performance/schedule

A 4 partner action item list will be managed.

CNES will lead the telecons and manage and maintain the risk register, master schedule and action item list

11. MANAGEMENT OF HARDWARE AND SOFTWARE DELIVERED BETWEEN PARTNERS

According to the MOU hardware and software can be delivered between the partners.

Each Partner will retain ownership of elements and equipment it furnishes to another Partner, except as otherwise agreed.

Any equipment not launched into space will be returned to the furnishing Partner at such time as mutually agreed, unless otherwise agreed.

Each Partner will transport its equipment to the delivery points, as specified in the deliveries documents, and, where appropriate, from such delivery points, when the equipment is to be returned to the furnishing Partner.

11.1 “CNES TO NASA” AND “NASA TO CNES” DELIVERIES

The detailed deliveries planned between CNES and NASA are described in the following documents :

- MOU (RD1)
- TECHNICAL ASSISTANCE AGREEMENT BETWEEN CALIFORNIA INSTITUTE OF TECHNOLOGY (CALTECH) AT NASA’S JET PROPULSION LABORATORY (JPL) AND CENTRE NATIONAL d’ETUDES SPATIALES (CNES) – date : Feb 12, 2004
- JASON-2 PAYLOAD INSTRUMENTS DELIVERABLES ITEM LIST (AD3).
- LETTER OF AGREEMENT BETWEEN NASA AND CNES- date : Aug 1, 2005 which covers the delivery of a PROTEUS Platform Interface Simulator (PPIS) and a breadboard of the Traveling Wave Tube Amplifier (TWTA).

11.2 “CNES TO NOAA” AND “NOAA TO CNES” DELIVERIES

The detailed deliveries planned between CNES and NOAA are described in the following documents :

- MOU (RD1)
- OSTMJASON-2: CNES/NOAA DELIVERABLES ITEM LIST (AD6)

As a main delivery CNES will deliver to NOAA a Near Real Time processor (software, documentation and training) for OGDR production and a Data Remote Processing PC (DRPPC) as a validation tool. CNES will handle the maintenance of the NRT processing system.

11.3 “CNES TO EUMETSAT” AND “EUMETSAT TO CNES”DELIVERIES

The detailed deliveries planned between CNES and EUMETSAT are described in the following documents :

- MOU (RD1)
- OSTMJASON-2: CNES/EUMETSAT DELIVERABLES ITEM LIST (AD5)
- CNES-EUMETSAT COOPERATION AGREEMENT (RD2)

As a main delivery CNES will deliver to EUMETSAT elements of the Earth Terminal, a Near Real Time processor (hardware, software, documentation and training) for OGDR production and a Data Remote

Processing PC (DRPPC) as Earth Terminal monitoring tool. CNES will handle the maintenance of the NRT processing system.

11.4 "NASA TO NOAA" AND "NOAA TO NASA"DELIVERIES

The detailed deliveries planned between NASA and NOAA are described in the following documents :

- MOU (RD1)
- OSTMJASON-2: NASA/NOAA DELIVERABLES ITEM LIST (AD12)

The major delivery by NASA to NOAA is the software and documentation for JASON-2 Telemetry, Command, and Communications Subsystem (J2TCCS).

12. ANNEXES

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DOCUMENTATION CHANGE RECORD

Issue.	Rev.	Dates	Pages	Modifications	Visa
0	0	Sep 1, 2005	All	Preliminary issue for comments	
0	1	Nov 21, 2005	All	Preliminary issue with partners comments	
0	2	Nov 29, 2005	All	New issue with all the sections	
0	3	Dec 1, 2005	All	New issue for PDR preparation telecon	
1	0	Dec 7, 2005	All	First issue for System PDR	
1	1	Jan 30, 2006	All	Modifications according to System PDR recommendations – rev 1	
1	2	Feb 9, 2006	All	Modifications according to partners comments	

DIFFUSION

Document : TP3-J0-GP-104-CNES **Issue. :** 1 **Rev. :** 2 **date :** Sep 1, 2005**.**

OSTM/Jason-2 Project Plan

DIFFUSION CNES			
Noms	**Sigles**	**Bpi**	**Ex.**
BOURDEIL M.	DCT/AQ	1411	
LABRUNEE M.	DCT/AQ	1411	
LACROIX D.	DCT/AQ	1411	
CHIAVASSA F.	DCT/AQ/CQ	1412	
LAY Ph.	DCT/AQ/CQ	1412	
BEZERRA F.	DCT/AQ/EC	1414	
ECOFFET R.	DCT/AQ/EC	1414	X
LORFEVRE E.	DCT/AQ/EC	1414	X
VENTURIN J.	DCT/AQ/EC	1414	
ETIENNE J.	DCT/AQ/GP	2513	
ROMAN V.	DCT/AQ/GP	2513	X
VERLET E.	DCT/AQ/GP	2003	
PRESSECQ F.	DCT/AQ/LE	1414	
DURIN C.	DCT/AQ/MP	1413	
LAUTIER E.	DCT/AQ/QP	1415	X
MARTIN A.	DCT/AQ/QP	1415	
MARTIN Ch.	DCT/AQ/QP	1415	X
TONDU A.	DCT/AQ/QP	1415	X
DEDE G.	DCT/AQ/SF	1413	
LAULHERET R.	DCT/AQ/SF	1413	X
VERGNAULT E.	DCT/AQ/SF	1413	X
MOSKWA P.	DCT/D	2521	
CAZAUX C.	DCT/IB	2222	
CROS P.	DCT/IB/2I	2532	
ESCARNOT J.	DCT/IB/2I	2222	
HOZE P.	DCT/IB/2I	2003	
TRIBES R.	DCT/IB/2I	2504	X
GRIMBERT A.	DCT/IB/IL	2222	
CAMPAN G.	DCT/OP	1211	
CABRIERES B.	DCT/OP	1211	
POULIQUEN C.	DCT/OP	1211	
CORCORAL N.	DCT/OP/M2	3406	X
CREBASSOL Ph.	DCT/OP/M2	3406	X
LODS P.	DCT/OP/M2	3406	
COUTURE D.	DCT/OP/MO	1213	

DIFFUSION CNES			
Noms	**Sigles**	**Bpi**	**Ex.**
MOURY M.	DCT/OP/MO	1213	
BERGES D.	DCT/OP/MR	1215	X
MONGIS J.	DCT/OP/MR	1215	
CARRIERE A.	DCT/OP/SOL	3407	
JOUAN C.	DCT/OP/SOL	3407	X
MARLE M.	DCT/OP/SOL	3407	
POBLE JF	DCT/OP/SOL	3407	X
CARLIER A.	DCT/OP/SR	1216	
DE BEAUMONT O.	DCT/OP/SR	1216	
GOUDY Ph.	DCT/PO	2524	
AURIOL A.	DCT/PO/AL	2002	
BELLEFOND N.	DCT/PO/AL	2002	
COUTIN-FAYE S.	DCT/PO/AL	2002	
DEJUS M.	DCT/PO/AL	2002	
GRANIER JP.	DCT/PO/AL	2002	X
JAYLES C.	DCT/PO/AL	2002	
LAFON T.	DCT/PO/AL	2002	X
MALECHAUX M.	DCT/PO/AL	2002	X
NOUBEL J.	DCT/PO/AL	2002	X
PERBOS J.	DCT/PO/AL	2002	X
PETITBON I.	DCT/PO/AL	2002	X
PICOT N.	DCT/PO/AL	2002	X
SENGENES P.	DCT/PO/AL	2002	X
TAVERNIER G.	DCT/PO/AL	2002	
ZAOUCHE G.	DCT/PO/AL	2002	X
SARAPOFF C.	DCT/PO/GP	2502	
SERGUE E.	DCT/PO/GP	2502	
THOMAS P.	DCT/PO/GP	2502	
BLOUVAC J.	DCT/PO/MI	2532	
JOURET-PERL M.	DCT/PO/MI	2532	
LANDIECH Ph.	DCT/PO/MI	2532	X
LEDU M	DCT/PO/MI	2532	
ROLFO A.	DCT/PO/MI	2532	
TARRIEU C.	DCT/PO/MI	2532	
VIENNE D.	DCT/PO/MI	2532	X

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Noms	**Sigles**	**Bpi**	**Ex.**
VOGIN M.	DCT/PO/MI	2532	
WINTERHOLER M.	DCT/PS	1321	
BOUDOU P.	DCT/PS/CMI	1501	X
BOY F.	DCT/PS/CMI	1501	
GUINLE T.	DCT/PS/CMI	1501	X
VIDAL D.	DCT/PS/CMI	1501	
COUDERC V.	DCT/PS/SSC	1522	X
GELIE P.	DCT/PS/SSC	1522	X
LABRUNE Y.	DCT/PS/SSC	1522	
LAFITTE P.	DCT/PS/SSC	1522	X
LAFUMA P.	DCT/RF	2512	
LEMAGNER F.	DCT/RF/AN	3602	
BOUYER Y.	DCT/RF/BF	2512	
MEENS V.	DCT/RF/BF	2512	
PLA J.	DCT/RF/BF	2512	
BOULANGER C.	DCT/RF/HT	2013	
GUILLEMOT P	DCT/RF/HT	2013	X
LUVISUTTO E.	DCT/RF/HT	2013	
BENOIST J.	DCT/RF/IF	2012	X
GRONDIN M.	DCT/RF/IR	2013	
RAIZONVILLE Ph.	DCT/RF/IR	2013	
ROBERT E.	DCT/RF/IR	2013	
NABET G.	DCT/RH	1621	
ARBERET P.	DCT/SB/LV	2525	
LE GUEN Y.	DCT/SA	222	
LEPAROUX Ph.	*DCT/SA/AB*	1605	
VIC-HERNANDEZ M.	DCT/SA/AB	1605	
BLAIGNAN G.	DCT/SA/SI	2401	
PECHMALBEC S.	DCT/SA/SI	2401	X
JULIA G.	DCT/SA/SI	2401	
MARCHAL Ph.	DCT/SB	1421	
DELATTE B.	DCT/SB/BS	1712	
LABORDE G.	DCT/SB/BS	1712	
TOURRAILLE J.M.	DCT/SB/BS	1712	X
CAZAUX JM.	DCT/SB/CC	2214	

DIFFUSION CNES			
Noms	**Sigles**	**Bpi**	**Ex.**
MESNAGER J.M.	DCT/SB/CC	2214	X
PICART G	DCT/SB/CC	2214	
SCHAFFHAUSER F.	DCT/SB/CC	2214	X
TOULOUZE P	DCT/SB/CC	2214	
JULIEN E.	DCT/SB/MP	2527	
LASSALLE-BALIER G.	DCT/SB/MP	2527	
TYROU V.	DCT/SB/MP	2527	X
FRAYSSE H.	DCT/SB/MS	1324	
GAMET Ph.	DCT/SB/MS	1324	
PRADINES D.	DCT/SB/MS	1324	X
SALCEDO C.	DCT/SB/MS	1324	X
BERRIVIN S.	DCT/SB/OI	1214	
DUFOUR F.	DCT/SB/OI	1214	
HOURY S.	DCT/SB/OR	1323	X
MERCIER F.	DCT/SB/OR	1323	X
VAN TROOSTEN-BERGHE P.	DCT/SB/OR	1323	
PELIPENKO P.	DCT/SB/PS	1712	
TELLO M.	DCT/SB/PS	1712	X
AVIGNON M.	DCT/SI	1711	
CARAYON G.	DCT/SI/AR	2101	X
COURRIERE JL.	DCT/SI/AR	2101	X
STEUNOU N.	DCT/SI/AR	2101	X
MARTINUZZI J.	DCT/SI/IM	2111	
LAMBIN J.	DCT/SI/IM	2111	X
CUGNY B.	DCT/SI/IR	2101	
CAZENAVE A.	DCT/SI/LG	3200	
MENARD Y.	DCT/SI/LG	3200	X
GASC K.	DCT/SI/OP	3601	X
BOLOH L.	DCT/TV	1416	
LOUBEYRE J.Ph.	DCT/TV/AV	1713	
VINCENDET C.	DCT/TV/AV	1713	
FREDON S.	DCT/TV/EL	2213	
MASSOT J.	DCT/TV/EL	2213	
PANH J.	DCT/TV/EL	2213	

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Noms	**Sigles**	**Bpi**	**Ex.**
RAPP E.	DCT/TV/EL	2213	
TASTET P.	DCT/TV/EL	2213	
GUAY Ph.	DCT/TV/MS	1715	
MONDIER J.B.	DCT/TV/MS	1715	
BOUSQUET P.	DCT/TV/MT	1714	
DEJOIE J.	DCT/TV/MT	1714	X
DOUMIC L.	DCT/TV/MT	1714	
BRICOUT J.N.	*DCT/TV/SM*	1714	
GAYRARD J.	DCT/TV/TH	1716	
WERLING E.	DCT/TV/TH	1716	
EYMARD M.	DLA/D	EVRY	
BRANDT B.	DLA/SDS	501	
BURGAUD S.	DLA/SDS/AS	501	X
LARREGOLA R.	DLA/SDS/AS	501	
MAMODE A.	DSI/D	3512	
LEVY D.	DSI/EP	3515	
LASSERRE C.	DSI/EP/AR	3516	
PEGOURIE J.	DSI/EP/AR	3516	X
ALBRIEUX C.	DSI/EP/RT	3519	
JANICHEWSKY S.	DSP/D	212	
BOUVET I.	DSP/AI/ABM	2903	X
GROSJEAN F.	DSP/AI/ABM	2903	X
LEON-HIRTZ S.	DSP/EU	Paris	
BOISSIN B.	DSP/OT	2903	
THOUVENOT E.	DSP/OT	2903	X
ULTRE-GUERARD P.	DSP/OT	2903	X
VIDAL-MADJAR D.	DSP/OT	2903	
DOCUMENTATION – JASON2		2532	X

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Noms	**Sigles**	**Ex.**
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Noms	**Sigles**	**Ex.**
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ESCUDIER Ph	*CLS*	
LOAEC M.N.	*CLS*	
NHUN FAT B.	*CLS*	
ESCUDIER Ph	*CLS*	
ZANIFE O.Z.	*CLS*	

DIFFUSION EREMS		
Noms	**Sigles**	**Ex.**
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DIFFUSION JAXA		
Noms	**Sigles**	**Ex.**
GOKA T.	*JAXA*	X
KOMIYAMA T.	*JAXA*	
MATSUMOTO H.	*JAXA*	

DIFFUSION JPL		
Noms	**Sigles**	**Ex.**
ABID M.	*JPL*	X
AGRAWAL A.	*JPL*	
FU L.	*JPL*	X
VAZE P.	*JPL*	X
WIRTH J.	*JPL*	

DIFFUSION NOAA		
Noms	**Sigles**	**Ex.**
BANNOURA W.	*NOAA*	X
LILLIBRIDGE J.	*NOAA*	X
WADE A.	*NOAA*	X

DIFFUSION EUMETSAT		
Noms	**Sigles**	**Ex.**
BONEKAMP H.	*EUM*	X
FAUCHER D.	*EUM*	X
PARISOT F.	*EUM*	X
WANNOP S.	*EUM*	X
ZARZA R.	*EUM*	X

DIFFUSION NASA		
Noms	**Sigles**	**Ex.**
NEECK S.	*NASA*	X

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